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ABSTRACT

This follow-up study investigated the accuracy of screening measures used to detect potential learning problems in kindergarten and Grade 1 children by the Toronto Early Identification and Developmental Program (EIDP). The effect of students' language background and socioeconomic status on the predictive validity of the identification procedure was also assessed. Follow-up data were obtained for more than 2,000 of the 4,000 students who had been involved in the EIDP four years before. The identification procedure consisted of two psychological tests, a teacher-psychologist interview, and a teacher's rating chart of the child, done at the end of Grade 1. The teacher's input to the process was found to be the single most important part of the identification procedure in terms of accurate prediction of later achievement and grade placement. The total package classified 86% of the students accurately into "at risk" and "not at risk" groups. Language background did not significantly affect prediction accuracy, but students of lower socioeconomic status were classified incorrectly more often than children of higher SES families. (Author/CM)

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THE EFFECT OF LANGUAGE BACKGROUND AND SOCIO-ECONOMIC STATUS ON SCREENING PROCEDURES FOR THE EARLY IDENTIFICATION OF LEARNING PROBLEMS

Janis Gershman
Joan Kershaw

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IN MEMORIAM

This project was completed in memory of Joan Kershaw

Joan Kershaw was a member of the Special Education Department of the Toronto Board of Education. She built an international reputation through her work with children with learning difficulties, and through the work she did with adults teaching them about these children.

For her doctoral thesis, Joan chose to study the relationship of student socio-economic status and ethnicity to the problems of early screening for learning problems. At the time of her death, Miss Kershaw had completed her data collection for the project and had just begun to organize the data file. The study used follow-up data that she collected, as well as information on these students collected earlier by Psychological Services as part of their Toronto Early Identification Study, and by the Research Department as part of its first Every Student Survey.

Because people in both departments had worked with her in developing techniques for sharing this data, barely enough was known about her data file to undertake the analyses that are found in this report. Although we were aware of her intent, many of the details relating to the background of the study and the methodology followed, were not found. Thus, while the Research Department is responsible for the organization and treatment of this data, full credit must be given to Joan Kershaw for the development of the study, the data collection, and its preliminary organization.

It is very difficult to prepare a document of this sort - we hope that we have done Joan's work justice.

Janis Gershman,
Research Assistant.

E. N. Wright,
Director of Research.

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INTRODUCTION

Early Identification Research

For a number of years, those working in the fields of primary education have maintained that the early identification of children's learning problems is more likely to increase the chances of more efficiently and effectively helping these children than discovering and reacting to these problems after several years of school attendance. Estimates as to the number of children who display handicaps that will interfere with their educational development have varied from 10-20% of children entering kindergarten (MacLeod,1965) to 40% of all primary grade children (Rogolsky,1969). Although estimates vary widely, it appears that if a large number of such children are to be identified and helped, new strategies are needed in addition to the traditional approach of individual assessment of teacher-referred children.

Attempts to develop techniques for the early identification of learning problems have followed a number of divergent paths. These efforts have included clinical approaches with an emphasis on psychological symptoms, approaches with emphasis on socio-economic and cultural background, and approaches based on a medical model stressing the physiological basis of learning disabilities. A recent trend has been to identify potential problems in children earlier and earlier. Interventions such as pre-natal nutrition and instructions for mothers on good infant care are not uncommon as ways to prevent learning problems in "high risk" children.

The instruments used to measure, predict, and define potential

problems in learning have been equally diverse. A variety of screening and readiness tests have been developed to assess facets of children's development assumed to be related to school achievement. These screening tests claim to assess dimensions including intelligence, language, perception, cognition, physical-motor skills, and behaviour (Cartwright et al.,1973; De Hirsh et al.,1966). Many of these tests, however, are both too time consuming and expensive for the majority of large public school systems and the reliability and validity of many items for prediction of school achievement is as yet uncertain.

Many studies have also indicated that teachers' systematic observation of children's behaviour in the classroom has provided useful data for early identification of children with learning problems (Keogh & Becker, 1973; Forness, et al.,1976; Forness & Esveldt, 1975). A study in North York where kindergarten teachers were asked to rank their pupils in terms of achievement and behaviour, and predict the progress of these students to Grade 3, indicated after the follow-up was done,that the kindergarten teachers were good predictors of future academic success (Virgin & Shecter,1974).

Given the wide variety of approaches to early identification and the large number of screening instruments available, a large urban school board interested in instituting an early identification program is faced with some difficult decisions:

What age is "early"?

What screening devices should be used:

Do they have predictive validity?

Are they appropriate for students of different language and socio-economic background?

Who does the screening?

Is the procedure cost-effective?

What interventions will follow the identification?

Many of these questions have not been successfully or completely answered by research and school boards have been left to find for themselves the most suitable early identification procedures for their unique situation.

In choosing screening procedures for use in a large urban school system, certain considerations are necessary. Money and personnel time are usually at a premium suggesting that "group" measures might be more appropriate than individually administered tests. Another consideration is that many of the early identification procedures and instruments have been standardized on white American middle class samples and the results cannot necessarily be generalized to a multi-cultural urban population with students of widely varying background. For this reason, many early identification inventories include non-verbal tests that identify perceptual and cognitive factors. In a population of students where a large percentage of the children come from non-English speaking or low-SES backgrounds, the use of verbal tests is sometimes considered unfairly discriminating. The Gesell Perceptual Forms test (Gesell & Armatruda, 1948) and the Goodenough Draw-A-Person test (Goodenough, 1963) are examples of two non-verbal tests that were included in the Toronto Early Identification test battery. Research has shown that strengths or weaknesses in either visual or auditory perceptual tasks in first graders were in varying degrees, predictive of school progress (Morency & Wepman, 1973; Koppitz, 1959, Frostig, 1972).

The effect of a student's background on school success is a phenomenon well-documented by educational research. Study after study has shown that the socio-economic status of a pupil's family -- his parents' income, education and occupation, prove to be significant predictors of his educational success. In a study done in Toronto relating students' background to grade placement, children from the lower socio-economic groups were more than six times as likely to be in special classes for slow learners than children from higher socio-economic groups (Deosaran et al., 1976). Reasons given for the frequent occurrence of learning problems among "disadvantaged" students have ranged from living in a "hostile unstimulating environment" to pre-natal deprivation and birth difficulties to a "middle class oriented school system". (Jencks, 1972; Coleman & Sandhir, 1976; Koppelman et al., 1969). Because of the wide variety of possible causes, the idea of early identification is useful in order that more individual diagnosis and help may be given early through multi-disciplined channels.

Unfortunately, very few studies have considered the effects of varied students' background on early identification procedures. Most screening programs have included non-verbal testing instruments with the assumption or hope that the instruments are equally valid for students of differing socio-economic status or language background. However, there is no evidence as yet that these assumptions are correct.

In large cities, such as Toronto, where 45% of the students do not speak English as a first language, and where at least half of the students are below "middle-class" socio-economic status, the effects of students' background is a crucial issue to consider in implementing an early identification program.

The unfairness of intelligence tests "labelling" children from non-English-speaking background or low-SES background has also for the past several years been a source of concern to many people in fields of education and psychology. Early identification being partly a predictive procedure of school success also runs the risk of being another "labelling"phenomenon. When children are identified as "high risk", a set of expectations, anxieties and differential treatment patterns may develop. It is especially important to be aware of this danger because often early identification procedures do not identify current specific learning disorders in the child, but they hypothesize about future development from present behaviour. Moreover, it must be stressed that although early identification procedures are generally good group predictors, definitive long term prediction about individual children is very risky. However, all of the experts agree that as long as everyone involved in the identification process is aware of the problem and precautions are taken to minimize the potential hazard of "labelling" the advantages of a screening program far outweigh the disadvantages.

The Toronto Early Identification and Developmental Program

The Board of Education for the City of Toronto has accepted early identification of learning problems as a major priority. Since 1967, the Toronto Board has attempted to identify procedures which could be applied to large urban populations, and which might prove to be reliable predictors of learning disabilities in children. The Early Identification and Developmental Program (E.I.D.P.) began in 1967 as a pilot project carried out by the Department of Psychological Services. Different samples of pupils from Kindergarten and Grade One were obtained over a period of a few years and different screening procedures were used in an attempt to discover what might be the most appropriate measures for initial screening processes.

The E.I.D.P. is not a single event or a test package but a process which may be described in terms of "successive sieves"; every student is included in the initial screening, some are selected for further assessment, and a few are identified who require intensive psychological evaluation (Landrus et al, 1974). Consultation with the classroom teacher is an essential part of the E.I.D.P. at every stage. Figure 1 illustrates the steps of the E.I.D.P. program, while Figure 2 places them in the context of school and family. The reader is referred to a recent article entitled "The Toronto Early Identification and Developmental Program: Evolution and Expansion" for a history of the E.I.D.P. from its pilot study stage to its current form (Brown & Perkins, 1977).

In a research study done during the first years of the E.I.D.P. different techniques and instruments were used with both Kindergarten and Grade One pupils to determine the most adequate procedure for the early identification of children with potential learning difficulties (Landrus et al, 1974). Basically, two screening packages used both in Grade One and Kindergarten were compared:

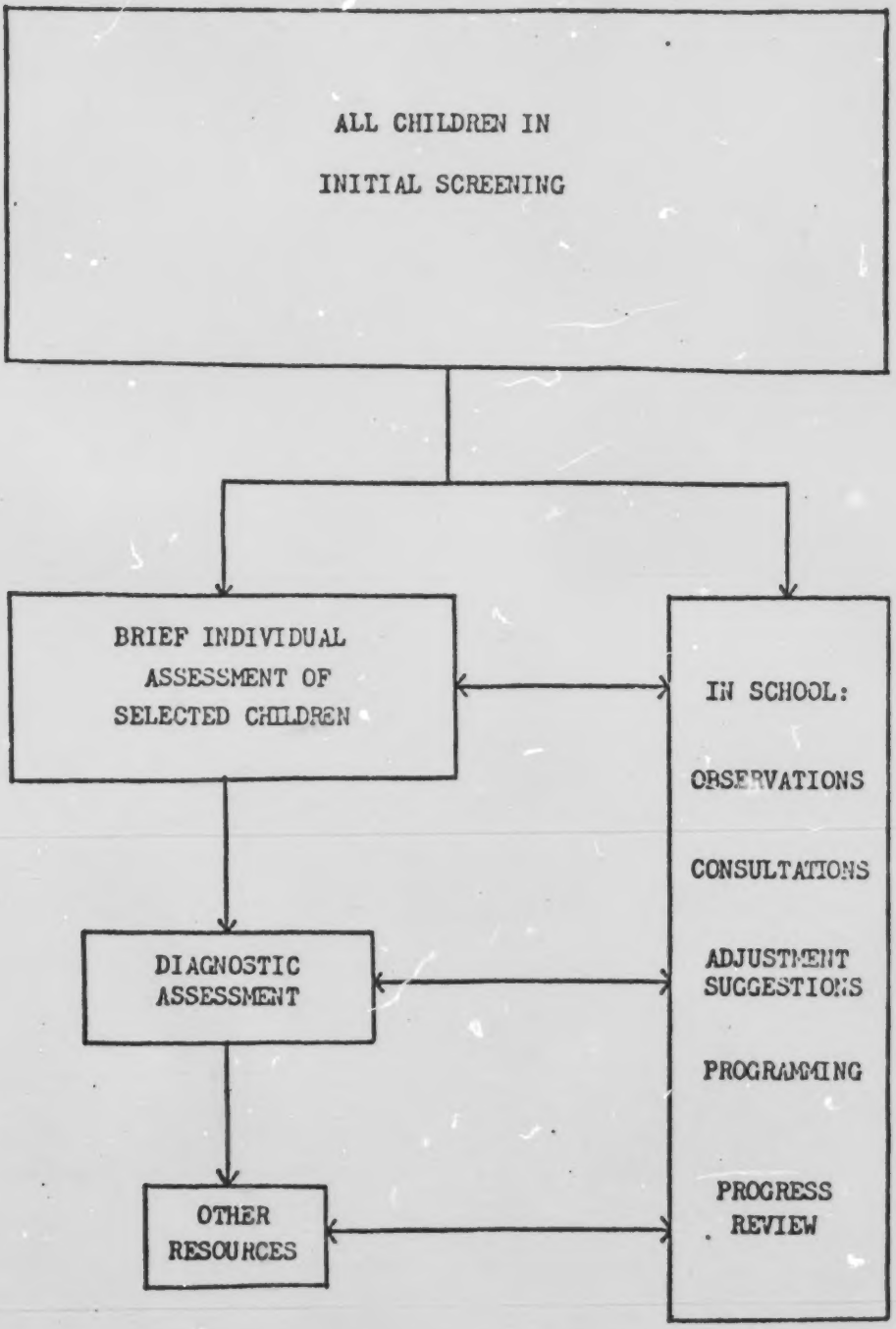

Fig. 1. Successive sieves model of screening employed in the Early Identification and Developmental Program.

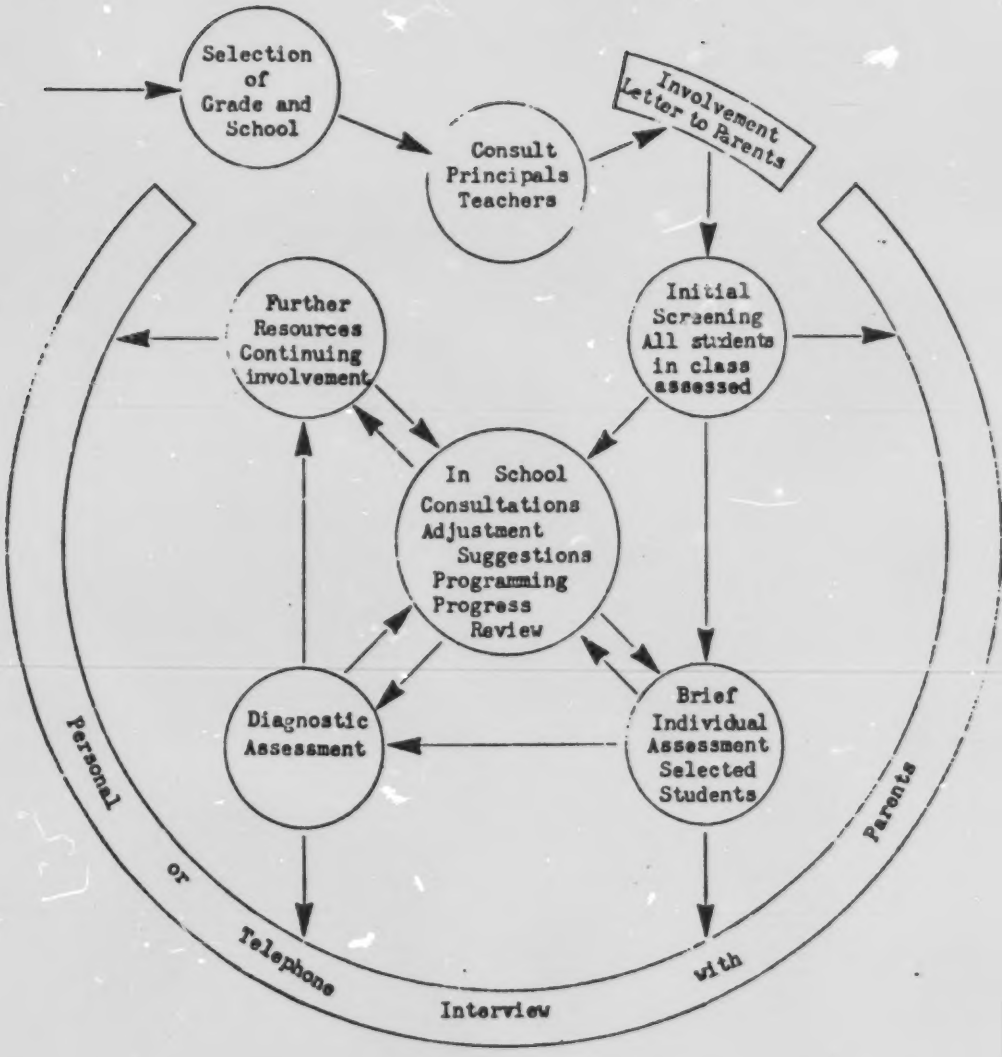
Selection of Grade and School
Consult Principals Teachers
Involvement Letter to Parents
Further Resources Continuing involvement
Initial Screening All students in class assessed
In School Consultations Adjustment Suggestions Programming Progress Review
Diagnostic Assessment
Brief Individual Assessment Selected Students
Personal or Telephone Interview with Parents

Fig. 2. Phases in Early Identification and Developmental Program proces

a teacher-psychologist interview in conjunction with either the Kirk XO test (Kirk, 1974), or the Draw-A-Person test (Goodenough, 1963), along with the Perceptual Forms test (1969). The latter package was used in the screening of the Grade One sample that this current study is concerned with and a more detailed discussion of the tests will be given in the next chapter. After comparing the two packages in terms of predicting success in either Grade One or Grade Two, the researchers concluded that for Grade One screening the teacher-psychologist interview in combination with the Draw-A-Person and Perceptual Forms was superior to the combination of teacher-psychologist interview and XO test. For kindergarten screening, essentially no differences were found between the two packages. For a detailed discussion of this research study and a "service manual" for the E.I.D.P.,the reader is referred to the document entitled "The Toronto Early Identification and Developmental Program" (Landrus et al., 1974). Although this research study considered students' socio-economic and language background, limited financial resources precluded extensive examination of the relationship between the screening procedures and students' background.

Validating the E.I.D.P. Procedures

One of the original purposes of early screening is to detect potential learning problems in children before they actually occur. However, the predictive validity of the screening devices used has rarely been tested beyond a one or two-year follow-up period.

Part of the reason for the lack of data on predictive validity is a methodological paradox: if an early identification program is completely successful, the child identified as "high risk" would receive some kind of intervention and would be a successful achiever in future grades. In this case, predictive validity of the identification instruments would be low. In

essence, success with the child would negate accuracy of prediction. However, in reality, few early identification programs are so completely successful, and testing predictive validity can be done to at least a limited extent.

In the early years of the Toronto E.I.D.P., the developers of the program were interested in producing a useful set of screening instruments which would identify "high risk" children. Because of the time demands placed on the psychologists to develop and administer these tests, much of the E.I.D.P. was not effectively translated into classroom programs as E.I.D.P. is attempting to do today. Consequently, a situation existed which allowed an examination of the long-term predictive validity of the screening package that was used in the Toronto E.I.D.P.

By gathering background data on the sample of almost 6,000 Grade One students involved in the E.I.D.P. screening, many questions relating background of students to early identification procedures could be tested. Also, by looking at these students' educational placement and achievement four years after the screening some very important questions relating to the Toronto E.I.D.P. could be examined:

(1) Are extensive screening devices combining group tests (Draw-A-Person and Perceptual Forms) with teacher-psychologist interviews and teacher rating lists useful and accurate predictors of possible school learning problems?

(2) Does socio-economic status of a student affect the validity of the screening techniques?

(3) Does a student having a native language other than English affect the validity and accuracy of early screening?

(4) How many and what kinds of students, in terms of background, are being missed by the screening or are being identified unnecessarily?

It is believed that this study will provide some useful information to the Toronto Board of Education on the use of the screening instruments of the E.I.D.P. It is not really a study of the effectiveness of the E.I.D.P. as a program, but the study of the validity of some of the screening measures used, and how the validity of these measures is affected by students' background. This information might also be useful to other multi-cultural school systems of comparable size and SES levels where school failure is a significant issue.

METHODOLOGY

The Sample

In the 1969-70 school year, over 6,000 Grade One students were involved in the Toronto E.I.D.P. screening program. This group of Grade One students from 58 randomly selected schools across the City of Toronto, comprised the initial sample of pupils in the study.

The Every Student Survey

In May of 1970, the Toronto Board of Education conducted a survey of the background of every student in the school system, (Wright, 1970). Each student was required to complete a one-page questionnaire which asked questions related to country of birth, first language, and parents' occupation. For very young children, the data collection demanded a large amount of teacher time which was spent telephoning parents, checking records and talking to pupils. A copy of the questionnaire is included in Appendix A.

Four categories were established to describe the language status of the student. They were:

1) Students born in Canada, English the first language

*2) Students born in Canada, English not the first language

3) Students not born in Canada, English the first language

*4) Students not born in Canada, English not the first language.

The occupation of the head of the household was coded using the Blishen Scale (Blishen, 1967). In this scale, the occupational categories are those used by the Dominion Bureau of Statistics for census purposes. The code numbers were calculated from census data by combining the average

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* includes those students who learned English and another language at the same time.

income and the average educational level found in Canada for each of the occupations. While this scale does not always provide an accurate index of a specific person's status, it is suitable when dealing with a large number of students where only averages are required. Blishen's scale was calculated only for men: his categories were also used to categorize the women's occupations and this has affected the data when the head of the household is a woman.

For this study, to simplify analysis, Blishen's more than 300 categories were collapsed into 5 categories. Blishen's codes were also not suitable for coding some of the additional occupations and categories such as "unemployed", "mother's allowance", "welfare", etc. An additional sixth category was used for this group of students, usually significantly large in urban centres.

The Early Identification Process and Instruments

The Grade One screening for this sample began in the Fall of 1969. Letters were sent out to the parents informing them about the screening process and translations of the letter into several languages were prepared for parents who were not fluent in English. An example of a letter to parents is included in Appendix A. Principals and teachers were also well informed about the screening procedures.

Initial testing included all children in the class. The administration of the Draw-A-Person test (D.A.P.) and the Gesell Perceptual Forms test took place in the home classroom of the students, usually with the teacher present, as well as the psycho-educational consultant, to help with supervision. The time required for this group testing rarely exceeded half an hour.

The Draw-A-Person test (Goodenough, 1963) is a popular test given to young children, usually along with other non-verbal tests, to get a rough indication of the child's accuracy of observation and the development of

conceptual thinking. The test calls for the child to "make a picture of a person". It may be administered to either individual children or groups.

For scoring the D.A.P. in E.I.D.P. assessment, attempts were made to incorporate the Harris revision (Harris, 1963) of the Goodenough scoring system. However, the Harris revision was found to be more difficult, so the Goodenough system was finally used.

The Gesell Perceptual Forms test (1969) was developed to test the visual-motor co-ordination of young children in copying geometric figures. It can also be administered to either groups or individuals. A detailed scoring guide (developed through E.I.D.P.) for the Perceptual Forms Test is included in Appendix A along with the instructions for administering both the Perceptual Forms Test and the Draw-A-Person test.

Along with these two paper and pencil tests "Phase I" screening, which involved all children, included teacher-psychologist interviews where all children in the class were discussed. The interview focussed on eleven areas of possible difficulties for the child. They were vision, hearing, gross motor, fine motor, activity level, memory, concept formation, language, attention span, behaviour and group interaction. A copy of the interview form is included in Appendix A. Records were kept for children who had problems in any of the eleven areas.

In the Spring of the Grade One year, the teachers were asked to complete a "Teacher Rating Chart" which asked the teacher to rate the pupil's progress in reading, mathematics, and general performance level. A copy of the form is included in Appendix A.

In summary, in the Fall of Grade One, 1969, the following data was collected: Draw-A-Person scores, Perceptual Forms scores, and reports of the teacher-psychologist interview (Phase I screening data). In the Spring of Grade One, 1970, the background information on the children was collected as well as teacher ratings on achievement.

Follow-Up Procedures

Four years later, in 1973-4, when most of the children were in Grade Five, follow-up procedures for this study began. An attempt was made to locate each student involved in the Grade One E.I.D.P. assessment. For those who were still in the Toronto school system, the grade/class placement was recorded and the Wide Range Achievement Test was administered.

The Wide Range Achievement Test (W.R.A.T.) (Jastak & Jastak,1965) was first standardized in 1936 as a tool to study the basic school subjects of reading as represented by word recognition and pronunciation subtests, written spelling, and arithmetic computation. It is usually used as an adjunct to tests of intelligence and behaviour and is often, because of the "wide range" of scores it taps, used as an assessment device to get a rough indication of grade-level functioning. There is some criticism, however, that the test is not truly a measure of school "achievement" but a test of a more "general intelligence factor" (Merwin,1965; Thorndike,1965). However, the grade/class placement of a student along with the W.R.A.T. scores was thought to be a good indication of a child's achievement level.

It was originally intended to determine what types of supportive help (if any) that the children involved in the E.I.D.P. assessment received during the four year period between assessment and follow-up. However, such data were not easily available and only supportive help being received at the time of follow-up could be noted.

After all of the follow-up data were collected, scored, and coded, the information was analysed in relation to the Grade One assessment and background variables.

RESULTS

Background of the Students

In the fall of 1969, usable Early Identification data were collected from 4,475 Grade One pupils at 41 different Toronto public schools. The great majority of the students were 6 years old (86%) and there were just slightly more males than females (52% male, 48% female).

In terms of language and socio-economic background, the Grade One students selected were quite representative of the total Toronto school population. The results of the Every Student Survey revealed the following about the background of the Grade One pupils in the sample:

1) 75.7% of the students were born in Canada (for the total Toronto school population 74.5% were Canadian born).

2) Of those not born in Canada,

   25.5% were born in Italy
   12.4% were born in Portugal
   9.7% were born in Greece
   8.7% were born in England
   5.7% were born in West Indies
   4.4% were born in United States
   2.6% were born in China and Hong Kong
   2.6% were born in Yugoslavia
   1.6% were born in Scotland
   1.5% were born in Poland
   1.4% were born in Germany

   All other countries, less than 1%.

   Over half of these students came to Canada between the ages of 4 and 6.

3) 57.2% of the pupils in the Grade One sample learned English as their first language. 30% learned English as their second language, and 11.2% reported learning English and another language at the same time.

4) 87% of the Grade One pupils lived with both parents, 9.3% with mother only, 1.1% with father only, and 1% with neither parent. There was no information for 1.7%.
(In the total population 84% of students lived with both parents).

5) An examination of parents' occupation revealed that almost half of the students in the Grade One sample (47%) had parents in the lowest occupational group. As classified by the Blishen scale, the distribution of SES background was as follows:

TABLE 1

SOCIO-ECONOMIC STATUS FOR HEAD OF HOUSEHOLD

Occupation Group	No. of Students	Percent of Students
1 Special Category -- Welfare, Retired, Unemployed, etc.	392	9
2 Labourers, Truck Drivers, Waiters, etc.	2,099	47
3 Mechanics, Sales Clerks, etc.	536	12
4 Electricians, Printing Workers, etc.	376	8
5 Athletes, Dental Technicians, etc.	326	7
6 Clergymen, Lawyers, Engineers, etc.	553	12
No Information	195	4

These percentages closely approximate the distribution of occupations found in the total Toronto school population. Occupation category 2 was just slightly larger for this Grade One sample than for the general population.

The E.I.D.P. Results

The results of the administration of the Early Identification Phase I screening instruments, specifically the Draw-A-Person test, the Perceptual forms copy test, the Teacher-Psychologist Interview and the Teacher's Rating Chart revealed some interesting results in relationship to a student's background.

Draw-A-Person I.Q.

The average D.A.P. I.Q. for the Grade One sample was 98.8. However, some interesting variations occurred. The average D.A.P. I.Q. for girls was 101.1 and for boys it was 96.8, a statistically significant difference ($f = 40.8, p < .001$). Other significant differences within the sample, occurred when the students' socio-economic status was considered. The following table shows the relationship between increasing SES and D.A.P. I.Q.

TABLE 2

DRAW-A-PERSON I.Q. BY SES GROUPS

SES	Average DAP I.Q.	No. in Group
1 Special Group, Unemployed, etc.	95.4 (s.d. = 15.0)	346
2 Labourers, etc.	97.5 (s.d. = 15.0)	1,961
3 Mechanics, etc.	98.4 (s.d. = 14.6)	500
4 Electricians, etc.	101.1 (s.d. = 15.7)	349
5 Athletes, etc.	100.5 (s.d. = 14.3)	306
6 Clergymen, etc.	105.1 (s.d. = 15.3)	504
All Students	98.8 (s.d. = 15.3)	3,966

($f = 20.0$, df = $p < .01$)

No significant differences were found between the average D.A.P. I.Q.'s of different immigrant language groups or between students living with

both parents, one parent, or no parent.

Perceptual Forms

The average total score for the 4,163 Grade One pupils was 10.6. No significant variation occurred in the mean score between sexes, between language groups, or between children from different family situations. However, there was a trend among the SES groups indicating a higher score for the higher SES.

TABLE 3

PERCEPTUAL FORMS SCORES BY SES GROUPS

SES	Average Perceptual Forms Total	No. in Group
1 Special Group	9.9 (s.d. = 3.2)	345
2 Labourers, etc.	10.4 (s.d. = 3.0)	1,968
3 Mechanics, etc.	10.5 (s.d. = 2.9)	498
4 Electricians, etc.	10.6 (s.d. = 2.9)	352
5 Athletes, etc.	11.0 (s.d. = 2.8)	308
6 Clergymen, etc.	11.7 (s.d. = 2.8)	508
All Students	10.6 (s.d. = 3.0)	3,979

($f = 16.3$, $p < .001$)

Teacher-Psychologist Interview

Data were available for 806 pupils who had at least one area of difficulty in the eleven areas covered by the teacher-psychologist interview. The three most frequently mentioned areas of difficulty were fine-motor, behaviour and attention span. The following table shows the frequencies of mention for the eleven areas of difficulty.

TABLE 4

STUDENTS'DIFFICULTIES INDICATED IN TEACHER-PSYCHOLOGIST INTERVIEW

Area of Difficulty	No. of Children Mentioned
Behaviour	495
Fine-motor and eye-hand co-ordination	424
Attention span	323
Language	274
Concept formation	257
Activity level	244
Memory	237
Group Interaction	209
Gross motor	132
Hearing	94
Vision	45

Boys seemed to have a greater likelihood than girls of having at least one area of difficulty. Twenty-four percent of the boys in the screening were mentioned in the teacher-psychologist interviews compared with only 14% of the girls (X^2= 66, $p<.001$). Also, pupils with parents in the special occupation category (welfare, unemployed, etc.) had a much higher frequency of mention in the interviews. Thirty-five percent of these students had at least one area of difficulty compared to 15% of the students in the highest occupational category and 19% of the students in the lowest occupational category (X^2= 65, $p<.001$). Pupils from one or no-parent families were also more likely to have difficulties as indicated by the interview than pupils from 2-parent families; 30% and 17% respectively (X^2=55, $p<.001$). Language background or immigrant status appeared to have no effect on whether a student would be "selected" by the interview.

Most of the 806 students who were discussed in detail during the interview had fewer than three areas of difficulty. No background variables, however, seemed to affect the number of difficulties mentioned -- only whether or not any were mentioned at all.

Teacher's Rating Chart

The scores on the 5 subsections of this rating scale were totalled to arrive at a general teacher's rating. The average total score was found to be 15.9. Girls scored significantly higher than boys (girls: 16.5, boys: 15.4) ($F = 26.3, p<.001$). Higher SES pupils were also rated better by their teachers than lower SES pupils.

TABLE 5

TEACHER RATINGS BY SES

SES Group*	Average Total Rating	No. in Group
1	13.8 (s.d. = 4.8)	336
2	15.1 (s.d. = 4.4)	1,914
3	15.7 (s.d. = 4.3)	486
4	17.1 (s.d. = 4.3)	348
5	17.5 (s.d. = 3.9)	302
6	18.9 (s.d. = 5.2)	540
All Students	15.9 (s.d. = 4.6)	3,926

($f = 66.8, P< .001$)

* for description of codes, see Table 1, Page 18

Relating pupil's immigrant language background to teacher ratings revealed slightly higher than average ratings for those pupils not born in Canada with English as their mother tongue ($f = 10.6$, $p<.05$). Pupils from

families where both parents were present also received slightly higher teacher ratings than pupils from single or no-parent families ($f = 15.9$, $p<.05$). However, some of these differences could be attributed to the variation in SES among the groups.

The Inter-relationship of E.I.D.P. Assessment Variables

Examining the correlations between the Draw-A-Person I.Q., the Perceptual Forms test, the Teacher-Psychologist Interview and the Teacher Ratings, reveals a modest relationship among the assessment variables. The co-efficients do suggest that generally if a child does well on one measure he will probably do well on another. However, the co-efficients are also low enough to suggest that each instrument is measuring different aspects of the child's achievement. Table 6 indicates these correlations.

TABLE 6

E.I.D.P. INSTRUMENT INTERCORRELATIONS

Instrument	Draw-A-Person Test	Copy Forms	Teacher-Psychologist Interview	Teacher's Rating
Draw-A-Person I.Q.	1.00	.34	.21	.32
Copy Forms		1.00	.24	.43
Teacher-Psychologist Interview			1.00	.41
Teachers' Rating Total				1.00

All correlation co-efficients are significant at the .001 level.

Follow-Up Results

Four years after the E.I.D.P. screening, including the teacher ratings, an attempt to locate all students was made, and for all those in the Toronto system, their grade placement was noted and the Wide Range Achievement Test was administered. In this section, the results of the follow-up will be given as well as an analysis of the effects of E.I.D.P. assessment and a student's background on the follow-up results.

Follow-up information was obtained in 1973 for 2,032 students (45.4% of the initial 1969 sample.) For 54.6% of the original sample, no follow-up was available because the students had left the Toronto school system. There were differences, both in terms of background and E.I.D.P. measures, between the sample of students who remained in the Toronto system and those who left during the five years. In general, in the group remaining in the system five years after the E.I.D.P. assessment, there were relatively fewer low-SES students, more Canadian-born students, with English as their first language, and fewer students from mother-only homes. In terms of scores on the E.I.D.P. measures, the group remaining in the Toronto system tended to score slightly higher on the Draw-A-Person test, perceptual forms, and teachers' rating chart.

In 1973-74, the grade placement of those students remaining in the Toronto system was as follows:

TABLE 7

GRADE PLACEMENT OF STUDENTS AT FOLLOW-UP

Grade	Number of Students
3	3 (.1%)
4	359 (18%)
5	1502 (74%)
6	36 (1.8%)
Special Classes	132 (6 %)
TOTAL	2032

Almost three-quarters of the students were in Grade 5, as expected if they had progressed "normally" since the Grade One screening. Just fewer than one-quarter of the students were either behind at least one grade or in a full-time special class placement. Thirty-six students were ahead by one grade.

At the time of follow-up, the students were administered the Wide Range Achievement Test. The results were as follows: For the reading sub-test, the average score was 68.6 (s.d.=13.12) equivalent to a grade level of 5.8; for arithmetic, the mean score was 35.7 (s.d.=5.0), equivalent grade level 5.3; and for spelling the mean score was 43.0 (s.d.=7.5), grade equivalent 5.3 (American norms were used).

As expected, with this type of test, results varied widely, with scores equivalent to "Kindergarten" level and a few equivalent to Grade "16".

Students in the special education classes tended to score around the Grade 3 level, with slightly better scores in arithmetic than in reading or spelling. The Grade 3 and 4 students scored around the Grade 4 level with higher scores in reading and arithmetic than in spelling. The Grade 5 and 6 students were achieving at about a grade 6 level with generally higher reading scores.

The results, by grade placement were as follows:

TABLE 8

W.R.A.T. SCORES BY GRADE PLACEMENT

Placement	Number of Students	Reading		Arithmetic		Spelling	
		Mean	Grade Equiv.*	Mean	Grade Equiv.*	Mean	Grade Equiv.*
Special Education	132	46.7 (11.6)**	2.6	28.9 (3.0)	3.5	30.7 (6.0)	2.6
Grade 3 or 4	360	59.4 (10.5)	4.3	31.7 (2.7)	4.4	37.3 (5.1)	3.8
Grade 5 or 6	1,538	72.6 (10.7)	6.6	37.2 (4.5)	5.5	45.4 (6.1)	5.8
TOTAL	2,030	68.6 (13.1)	5.8	35.7 (5.0)	5.3	43.0 (7.5)	5.3

* Based on American norms

** Standard Deviation appears in brackets.

In general, the results suggest a pattern of performance on the tests that is consistent with the grade placements. However, there were a few exceptions where students in Grade 6 scored relatively poorly on the W.R.A.T. and where students in Grades 3 or 4 did quite well on some of the sub-tests. These exceptions might in some cases relate to the test's short-comings.

Relationship between the W.R.A.T. Sub-tests

The scores on the three sub-tests were highly correlated. The reading sub-test scores and the spelling scores were the most highly correlated followed by arithmetic and spelling, and arithmetic and reading.

TABLE 9

CORRELATIONS AMONG THE W.R.A.T. SUB-TESTS

Sub-Tests	Correlations
Reading -- Arithmetic	.65
Reading -- Spelling	.87
Arithmetic -- Spelling	.70

The Relationship of Students' Background to Follow-Up

Before the results on the predictive reliability of the E.I.D.P. assessment and the effect that background has on that reliability are presented, the simple effect of background on follow-up placement and W.R.A.T. scores will be briefly considered.

There appeared to be significant differences in the background of students in different grade placements four years after the E.I.D.P. screening. Relatively more boys were found in special classes or behind one or two grades than were girls (18.9% of girls were in grade 3, 4 or special classes compared to 29.9% of the boys: $X^2 = 33$, $p<.001$. See Appendix B, Table 24).

The greatest differences in grade placements were between students of varying socio-economic status. Proportionately more of the low-SES students were found in special classes or in grades 3 or 4. In fact, close to half of the students in the special SES category (welfare, unemployed, etc.) were in special education or behind one or two grades ($X^2 = 80$, $p<.001$). (Tables 25-27 in Appendix B contain the detailed data).

No significant differences existed between the grade placement of students of different language or immigrant background (X^2= 1, n.s.). However, there was a trend for students of single or no-parent families to be slightly over-represented in special education classes and grades 3 and 4 (X^2=4.5, $p<.05$).

The greatest differences between the W.R.A.T. scores of students with varying background occurred between students of different SES. For all three sub-tests, (reading, arithmetic, and spelling), the higher the SES, the higher the W.R.A.T. scores (f=47.1, 50.9, 36.4, respectively, $p<.001$). Girls also scored significantly higher than boys in the spelling sub-test (f=17.4, $p<.05$). However, in the reading and arithmetic sub-tests, no significant differences between sexes were found. Students not born in Canada but speaking English as a first language scored slightly higher than any other immigrant/language group in the reading and spelling sub-tests. The results however, were not statistically significant (f=2.7, 3.0 respectively, $p=.15$). As well, students from 2-parent families tended to have slightly higher scores in all three sub-tests than students of one or no-parent families (f=10.3, 12.4, 11.3, respectively, $p<.05$). The reader is referred to Appendix B (Tables 28-31) for the detailed results relating background and W.R.A.T. scores.

The Relationship of E.I.D.P. Assessment Variables to Follow-Up

There are a number of ways that relationships between variables can be examined. A common method used in educational research and often a first step in looking at relationships is the correlation coefficient, which is just a general indication of the direct linear relationship between sets of variables. Often a more practical method of determining real relationships between variables is to use a regression analysis to determine the "proportion of the variance accounted for". The proportion of variance accounted for tells how much of the total variation in the dependent variable, (in this case, W.R.A.T. scores), can be explained by variation in the independent variables (E.I.D.P. measures). The higher the proportion of the variance accounted for, the greater reliability we

have in saying that the independent variables are "predictive" of the dependent variable.

Still another method of testing "predictive" relationship, is based on decision theory model. In effect, this model compares the "predicted values" based on the independent "predictor" variables (i.e., E.I.D.P. measures) with the actual values of the dependent variables (i.e., actual grade placement or W.R.A.T. scores). This method can also determine the number of cases predicted correctly, the number of cases predicted incorrectly, as well as the type of error that is made. A more detailed explanation of this model will be presented later in this section. Two statistical analyses (regression and discriminant) can also tell us which of the predictor variables contribute most to the prediction of the dependent variables, and the order of importance of all the independent variables in prediction.

The relationship of E.I.D.P. assessment variables to follow-up results was examined using all of the procedures mentioned above and the results will be presented and explained in logical steps:

1) simple correlations between independent and dependent variables.

2) regression analysis on W.R.A.T. scores:

   How well do all the E.I.D.P. assessment variables predict W.R.A.T. scores in terms of proportion of variance accounted for?

   Which of the independent variables provide the most information?

3) discriminant analysis on grade placement and W.R.A.T. scores:

   How well do the E.I.D.P. assessment variables discriminate between children in different grade placements at follow-up?

   Which variables discriminate best?

4) If we apply the "best" prediction function derived from the discriminant analysis, how many predictions are correct and what types of mistakes are made? If single independent measures are used, how are "cutting points" established and how accurate is the prediction?

5) How does a student's background affect the accuracy of prediction?

Simple Relationships Between E.I.D.P. Results and W.R.A.T. Scores

All E.I.D.P. scores were significantly related to W.R.A.T. scores. (i.e., all correlation coefficients were significant at the .001 level).

TABLE 10

CORRELATIONS BETWEEN E.I.D.P. VARIABLES AND W.R.A.T. SCORES

E.I.D.P. Measure	W.R.A.T. Scores		
	Reading	Arithmetic	Spelling
Draw-A-Person I.Q.	.33	.31	.32
Perceptual Forms	.33	.37	.34
Teacher-Psychologist Interview	.29	.29	.30
Teacher Ratings	.63	.64	.65

(N = 2,000)

As indicated in Table 10, the W.R.A.T. scores were much more highly correlated with the teacher ratings than with the other E.I.D.P. measures. However, it must be noted that the ratings were done in the Spring of Grade One, after a year's experience with the child and after the rest of the E.I.D.P. assessment which happened in the Fall of Grade One.

Regression Analysis on W.R.A.T. Scores

A regression analysis on the W.R.A.T. scores was performed to determine the relative contribution to the proportion of variance accounted for, by the individual assessment variables. A "stepwise regression" was used which allows variables to be entered into the analysis in any specified order. The order chosen was the order in which the E.I.D.P. instruments were administered: Draw-A-Person and Perceptual Forms, followed by the Teacher-Psychologist Interview, followed by the Teacher Ratings.

The multiple correlation coefficient between all the variables and the W.R.A.T. scores was around .65 (Reading .64, Arithmetic .65, Spelling .65). The total proportion of variance in the scores which can be accounted for by the E.I.D.P. assessment measures was therefore approximately 42%, (Reading 40%, Arithmetic 42%, Spelling 43%). Looking at the relative contribution of each prediction variable reveals that the teacher ratings are extremely important in "predicting" W.R.A.T. scores and for all three subtests increase the proportion of variance accounted for by at least 20%. The table which follows reveals the importance of each of the E.I.D.P. variables in predicting W.R.A.T. scores.

TABLE 11

RESULTS OF MULTIPLE REGRESSION OF E.I.D.P. INSTRUMENTS ON W.R.A.T. SCORES

W.R.A.T. Sub-Test	E.I.D.P. Variable	Multiple R	Proportion of Variance Accounted for (R^2)	Change in Variance
Reading	Perceptual Forms	.34	12%	--
	plus Draw-A-Person	.41	17%	5%
	plus Teacher-Psychologist Interview	.45	20%	3%
	plus Teacher Ratings	.64	41%	21%
Arithmetic	Perceptual Forms	.37	14%	--
	plus Draw-A-Person	.42	18%	4%
	plus Teacher-Psychologist Interview	.46	21%	3%
	plus Teacher Ratings	.65	42%	21%
Spelling	Perceptual Forms	.34	12%	--
	plus Draw-A-Person	.40	16%	4%
	plus Teacher-Psychologist Interview	.44	19%	3%
	plus Teacher Ratings	.65	42%	23%

What the regression analysis reveals, is that without teacher ratings, the E.I.D.P. assessment variables are not terribly good predictors of W.R.A.T. Scores: without the teacher ratings, 20% of the variance in W.R.A.T. scores is accounted for by E.I.D.P. predictors. With the ratings added, over 40% of the variance can be accounted for. Using teacher ratings alone, 36% of the variance can be accounted for.

Discriminant Analysis on Grade Placement and W.R.A.T. Scores

The regression analysis previously described gives an indication of the general effectiveness of the E.I.D.P. variables in predicting W.R.A.T. Scores. A more practical approach, however, in studying the effectiveness of the prediction is through a discriminant analysis which classifies the students into a specified number of groups and then compares the predicted classification with the actual classification. For example, based on the predictor E.I.D.P. variables, the analysis could classify students into 3 groups (e.g., low W.R.A.T. Scores, average scores, and high scores) and by comparing these classifications with actual scores, can say precisely how many students are correctly classified and how many are incorrectly classified.

The analysis also tells us what type of mistakes are made -- how many students are "selected" unnecessarily and how many students should have been selected but were not. Throughout this section, the terms "selection" and "identification" of students by the E.I.D.P. refer to the best statistical selection of students based on the best combination of E.I.D.P. variables. The following table illustrates this concept of "misses" and "false alarms" (unnecessary identification), which is based on a decision theory model. The data used in the table are actual results to be discussed in the next section. Table 13 provides similar information but with a little more detail.

TABLE 12

PREDICTED VS ACTUAL PLACEMENT

E.I.D.P. Prediction	Actual Placement -- 4 Years Later: In Special Education or Behind 1 or 2 Grades	In Grade 5 or 6
Will have difficulty	[13%] of students	(4%) **
Will <u>not</u> have difficulty	(9%) *	[73%]

[ ] correct prediction

( ) incorrect prediction

* students who should have been identified but were not -- "misses". Included in this group, however, are students who may have developed difficulties possibly due to some external event such as family break-up, which occurred after Grade One, and who were therefore impossible to predict.

** students who were identified as "at risk" but who at follow-up were doing "okay" -- a "false alarm". In this group, however, in theory, it is impossible to distinguish those students who were identified unnecessarily, from those students who were identified and who improved because of successful intervention. Since in this study little documented intervention occurred, (although it was more than in the earlier E.I.D.P. studies), it can be assumed that most of the students in this "false alarm" group were either identified by mistake, or just outgrew or overcame their problems in the regular course of their educational experience over the 4 years.

In actual practice, the people in charge of administering and interpreting the E.I.D.P. assessment can exercise control over the type of errors (misses or false alarms) that are made. For example, if the E.I.D.P. selected every child as "high risk", not one child would be missed. And in the other extreme, if only the few very worst children were selected as "high risk", there would be no false alarms, (i.e., unwarranted identification). Depending on the philosophy of the administrators, one type of error may be more tolerable than another. For example, if staff resources are plentiful, it might be more desirable to make sure no children are missed, with the risk of "over-identifying" since there would be sufficient resources to deal with

the problems that are identified. However, if staff resources are limited, perhaps only the worst children should be identified because possibly the staff could not be able to deal with a greater number of children. As well, many philosophical issues such as the social consequences of "labelling" or identifying small problems that a child may just outgrow need to be considered when establishing selection criteria.

The discriminant analysis used in this study to examine the predictions does not establish exact "cutting points" or selection criteria. What it does, is determines a classification function using the predictor variables which gives the fewest number of wrong predictions. It minimizes the total number of errors. The result of the analysis is a function that can be applied to each child's scores on the various E.I.D.P. measures to arrive at a group classification number (usually 1 or 2 for "at risk and not at risk"). Comparing these classifications with the child's actual placement, we can determine the number of accurate predictions made.

A discriminant analysis was performed to determine how well the E.I.D.P. variables discriminated between those students who 4 years later were either:

1) in special education, or behind one or two grades

OR

2) in Grade 5 or 6 (i.e., presumably, having no serious educational problems).

The results indicated that based on the best possible combination of E.I.D.P. assessment variables, 86% of the cases were correctly predicted. Table 13, similar to Table 12, but with more detail, shows the breakdown of the predictions.

TABLE 13

E.I.D.P. PREDICTION OF GRADE PLACEMENT

E.I.D.P. Prediction	Actual Placement: In Special Education or Behind 1 or 2 Grades		In Grade 5 or 6	
"at risk"	(230)	13% of Students	(74)	4.5%
"not at risk"	(160)	9.5% of Students	(1,252)	73%

[ ] correct prediction ( ) incorrect prediction

The predictor variables took on a similar order of importance in predicting grade level as they did in predicting W.R.A.T. scores. That order was: teacher ratings, perceptual forms, teacher-psychologist interview, and draw-a-person I.Q. In Appendix B further details are given on the classification function derived from the discriminant analysis.

Using this classification function, as indicated in Table 13, 86% of the cases (13% + 73%) were classified correctly. There are a number of ways that one can interpret these prediction tables and judge the "significance" of the prediction results. One of the ways would be to compare the results of the prediction to what would happen if there was no selection procedure at all. In this case, if no identification was done, the students who were having problems 4 years later (i.e., 22.5%) would have been missed. Therefore, with no identification procedure, 77.5% of the students would have been "correctly" placed.

A second way to look at the significance of the prediction is to compare the results obtained by the EIDP prediction with the results that one could expect from a prediction method that randomly assigned children to "at risk" and "not at risk" groups. One can then ask the question: What percentage of the children could one expect by chance to be accurately classified? In this case, through a Chi-squared analysis, the expected accuracy by chance

would be 68%. The difference between 68% and the obtained 86% was statistically significant (X^2= 32, p<.01). Table 14 shows the results of this analysis.

TABLE 14

OBSERVED VS. EXPECTED PREDICTIONS

Prediction	Actual Placement: Special Education or Grade 3 or 3		Actual Placement: Grade 5 or 6	
"at risk"	(4%)*	13% of students	(14%)	4.5%
"not at risk"	(9%)	9.5%	(64%)	73%

(X^2=32, p<.01)

* the percentages in brackets are those expected if the identification procedure had been random.

A third way to test the prediction results is by examining the "efficiency" and "effectiveness" of the prediction methods. Efficiency is defined as the percentage of students identified as "at risk" who actually turn out to be at risk, (i.e., more efficient implies fewer "false alarms"), and effectiveness is defined as the percentage of students actually at risk, who were identified as being at risk (i.e., more effective implies fewer "misses"). The same measures of efficiency and effectiveness can be applied to the prediction of "not at risk" children. In this example of predicting grade placement, the efficiency and effectiveness was calculated as follows:

in identifying "at risk" children: efficiency = 74%
effectiveness = 58%

in identifying "not at risk" children: efficiency = 88%
effectiveness = 94%

The numbers above reveal that using a prediction procedure which minimizes the total number of identification errors, the EIDP is more efficient and effective in predicting children "not at risk" than in predicting "at risk"

children.

The final method that can be used to judge the "significance" of the prediction and perhaps the most meaningful one,is simply to look at the actual number of children who are correctly and incorrectly identified and judge the results in terms of the human costs. Is 14% of the children an acceptable number to misidentify? This question cannot be answered statistically -- it can only be judged in human terms.

Another discriminant analysis was performed on the W.R.A.T. scores to determine the accuracy of the E.I.D.P. variables in selecting those students who either:

1) scored poorly on the W.R.A.T., i.e.,more than 1 standard deviation below the mean (usually that meant below a grade 3.6 level)

2) did not score poorly on the W.R.A.T.

The best combination of E.I.D.P. variables yielded about 86% accurate predictions, (86% for Reading, 87% Arithmetic, and 88% for Spelling). Specifically, the predictions were as follows:

TABLE 14

E.I.D.P. PREDICTION OF W.R.A.T. SCORES

W.R.A.T. Sub-Test	E.I.D.P. Prediction	Actual W.R.A.T Scores	
		Low Scores	Average or Good
Reading	at risk	4%	4%
	not at risk	10%	82%
Arithmetic	at risk	5%	4%
	not at risk	9%	82%
Spelling	at risk	4%	3%
	not at risk	9%	84%

□ correct prediction ○ incorrect prediction

However, if a random identification procedure was used to predict W.R.A.T. scores, because a small number of students are being selected as "at risk", the expected number of accurate predictions by chance would be 83%. The difference between 86% and 83% is statistically significant ($X^2 = 9.3$, $p<.01$). In terms of efficiency and effectiveness of the E.I.D.P. procedure to predict W.R.A.T. Scores the results were as follows: (based on predicting the reading scores)

"at risk" children: efficiency = 50%
effectiveness = 29%

"not at risk" children: efficiency = 89%
effectiveness = 95%

The results indicate that the E.I.D.P. procedure is not too "effective" in selecting children who will be "at risk" in terms of their W.R.A.T. reading scores.

The discriminant analysis on the W.R.A.T. scores was extended to determine how accurate the E.I.D.P. variables were in classifying students into 3 groups:

1) low W.R.A.T. scores (more than 1 standard deviation below the mean)

2) average W.R.A.T. scores (within 1 standard deviation of the mean)

3) high W.R.A.T. scores (more than 1 standard deviation above the mean).

As expected, the prediction of W.R.A.T. scores with a choice of 3 groups, was not accurate as the prediction for only 2 groups. There also tended to be a variation among the sub-tests in prediction accuracy.

For the reading sub-test the E.I.D.P. variables predicted at 71% accuracy; for arithmetic, 74% and for spelling 77%.

For all 3 sub-tests, the E.I.D.P. seemed to predict low-scores better than high scores. For example, in predicting Spelling scores, of those students who did achieve very low scores (more than 1 s.d. below the mean), 35% of them were identified by the E.I.D.P. as "at risk". However, of those students who achieved high scores (more than 1 s.d. above the mean), only 10% were identified by the E.I.D.P. as high achievers. Appendix B has the detailed results of this analysis and a sample of the computer output.

The accuracy of prediction by the E.I.D.P. assessment variables of both grade placement and W.R.A.T. scores was similar in terms of absolute numbers of students correctly identified. However, when the improvement over accuracy expected by chance was examined, the E.I.D.P. procedure did much better when predicting grade placement than it did when predicting achievement on the W.R.A.T. sub-tests. Moreover, the efficiency and effectiveness of the prediction procedure in selecting "at risk" children was much better for the prediction of grade placement than for the prediction of the achievement test results.

The Predictive Validity of Individual E.I.D.P. Instruments

The discriminant analysis revealed that the best combination of E.I.D.P. variables predicted student placement four years later with an 86% accuracy rate. The question then arises: How accurate are the assessment instruments individually in identifying students with potential problems? How does each assessment instrument compare with the "total package" in terms of accurate predictions? When examining the predictive validity of individual tests in terms of the specific number of correctly identified

students, the question of selection criteria or "cutting points" becomes important. For example, considering the Draw-A-Person I.Q.; if students with D.A.P. I.Q.'s in the bottom 2% are selected as "at risk" probably a lot of students will be "missed". However, if all students in the bottom 25% are selected, probably many students would be identified unnecessarily. To select a suitable "cutting point" to examine the accuracy of prediction, it was decided to choose the point where the total number of errors in prediction was minimized. It was also decided to examine the prediction of grade placement, not W.R.A.T. scores, since actual placement is a "real" indication of progress as opposed to W.R.A.T. scores which are test results and open to more variation and error than actual placement. The results for each assessment instrument are presented in the following tables with the "cutting points" specified.

TABLE 16

DRAW-A-PERSON I.Q. PREDICTIONS

Prediction	Actual Placement	
	Special Education or Grade 3 or 4	Grade 5 or 6
D.A.P. I.Q. < 84 "at risk"	(120) 6% of students	(136) 7%
D.A.P. I.Q. $\geq$ 84 "not at risk"	(333) 18%	(1302) 69%

78% of students accurately predicted by D.A.P. I.Q.

Expected accuracy by chance = 69% (X^2= 4.0, $p<.05$)

in identifying "at risk children: efficiency = 46%
effectiveness = 25%

in identifying "not at risk" children: efficiency = 79%
effectiveness = 91%

TABLE 17

COPY FORMS PREDICTIONS

Prediction	Actual Placement: Special Education or Grade 3 or 4		Actual Placement: Grade 5 or 6	
Total score < 8 "at risk"	(149)	8% of students	(108)	6%
Total score ≥ 8 "not at risk"	(288)	15%	(1353)	71%

79% of students accurately predicted by Copy Forms test.

Expected accuracy by chance = 69% (χ^2=10.7, p<.001)

in identifying "at risk" children: efficiency = 57%
effectiveness = 35%

in identifying "not at risk" children: efficiency = 83%
effectiveness = 92%

TABLE 18

TEACHER-PSYCHOLOGIST INTERVIEW PREDICTIONS

Prediction	Actual Placement: Special Education or Grade 3 or 4		Actual Placement: Grade 5 or 6	
At least 1 area of difficulty mentioned at interview "at risk"	(184)	9% of students	(131)	6%
No mentions at interview "not at risk"	(310)	15%	(1407)	69%

78% of students accurately predicted by Teacher-Psychologist Interview.

Expected accuracy by chance = 68% (χ^2=12.4, p<.001)

in identifying "at risk" children: efficiency = 60%
effectiveness = 38%

in identifying "not at risk" children: efficiency = 82%
effectiveness = 92%

TABLE 19

TEACHERS' RATINGS PREDICTIONS

Prediction	Actual Placement: Special Education or Grade 3 or 4		Actual Placement: Grade 5 or 6	
Total Rating score < 12 "at risk"	(222)	12%	(59)	3%
Total Rating score ≥ 12 "not at risk"	(223)	12%	(1379)	73%

85% of students accurately predicted by Teachers' Ratings

Expected accuracy by chance = 69% (X^2=30.3, $p<.01$)

in identifying "at risk" children — efficiency = 80%; effectiveness = 50%

in identifying "not at risk" children: efficiency = 86%; effectiveness = 96%

As indicated in the preceding tables, individual E.I.D.P. assessment instruments, with the exception of the teacher ratings, did not predict grade placement as accurately as the combination of variables as determined by the discriminant analysis. The teacher ratings, however, did predict grade placement four years later with an accuracy rate of 85%, just slightly less than the accuracy of prediction based on a combination of E.I.D.P. variables. The following table gives a summary of the significance of predicting "at risk" and "not at risk" children (in terms of grade placement) by the various E.I.D.P. measures as well as the "total package".

TABLE 20

E.I.D.P. PREDICTION SIGNIFICANCE SUMMARY

Prediction Measures of Significance	Instrument				
	Draw-A-Person I.Q.	Copy Forms	Teacher-Psychologist Interview	Teacher Ratings	Best Combination of Instruments
Number of Students accurately predicted	75%	79%	78%	85%	86%
Accuracy expected by chance*	69%	69%	68%	69%	68%
Identifying "at risk" children:					
efficiency	46%	57%	60%	80%	74%
effectiveness	25%	35%	38%	50%	58%
Identifying "not at risk" children:					
efficiency	79%	83%	82%	86%	88%
effectiveness	91%	92%	92%	96%	94%

* all of the differences between the obtained accuracy rate of prediction and the accuracy expected by chance were statistically significant.

The table reveals that the most accurate identification of "at risk" and "not at risk" children in terms of future grade placement was obtained by using either all the E.I.D.P. instruments or the teacher ratings alone. However, it must be stressed again, that the teacher ratings were done at the end of the Grade One year, after the initial EIDP process, and the influence in these ratings of the other instruments and of the existence of the E.I.D.P. itself cannot be isolated in this analysis.

The Effect of Background on E.I.D.P. Predictions

The previous sections have examined the predictive validity of the E.I.D.P. assessment process in terms of the accuracy of the instruments to predict grade placement four years after the assessment. To determine the influence of a student's background on the ability of the assessment to predict accurately, a discriminant analysis was carried out for each "background group" to determine the accuracy of prediction for each socio-economic group and for each language group. The analysis also revealed for each background group, which of the assessment instruments were most important in the prediction. To simplify comparisons and to make some SES groups larger, (for the discriminant analysis, the larger the groups, the better) the socio-economic categories were collapsed into 4 groups and the immigrant language categories into 3 groups.

The following table reports the accuracy of the E.I.D.P. prediction of grade placement for each socio-economic group as well as which E.I.D.P. variables contributed significantly to that prediction. The reader is referred to Appendix B for a complete prediction table for each SES group.

TABLE 21

THE EFFECT OF SES ON E.I.D.P. PREDICTION ACCURACY

SES Group	Number of Students	Percentage of Students Accurately Classified	E.I.D.P. Variables that Significantly Contributed to Prediction (in order) *
1. Special Cateogory -- Unemployed, Welfare, retired etc.	147	80.7	teacher ratings, teacher-psychologist interview
2. Labourers, truck drivers, waiters, etc.	921	83.9	teacher ratings, teacher-psychologist interview, copy forms, D.A.P. I.Q.
3. Mechanics, sales clerks, electricians, etc.	437	86.8	teacher ratings, copy forms, teacher-psychologist interview, D.A.P. I.Q.
4. Technicians, professionals, etc.	443	91.5	teacher ratings, copy forms
TOTAL	1,948	86.3	teacher ratings, copy forms, teacher-psychologist interview, D.A.P. I.Q.

($\chi^2 = 25, p < .001$)

* if an E.I.D.P. variable is not listed, it was not statistically significant to the prediction function.

Apparent from Table 21, is that SES does have a statistically significant effect on the accuracy of the E.I.D.P. to identify "at risk" and "not at risk" children. As socio-economic status increases, so does the number of children who are identified correctly. Table 21 also indicates differences among the groups concerning which E.I.D.P. measures were significant to the prediction. However, it must be pointed out that because teacher ratings accounted for such a large part of the prediction, differences between the other instruments were small.

Table 22 provides a summary of the comparisons that can be made among the socio-economic groups relating to significance of the prediction methods. For all SES groups, the E.I.D.P. predictions seem to be significantly better than any chance prediction. However, because for the lower SES groups, more students are being identified as "at risk", more identification errors are expected. The prediction method appears to be more "efficient" in identifying "at risk" students in the lower SES groups whereas in the higher SES groups, it is more efficient in identifying "not at risk" students. The "effectiveness" did not significantly vary among the groups. In terms of absolute differences between prediction accuracy expected by chance and obtained prediction accuracy, the improvement over chance was the greatest for the lowest SES group. Specifically, the improvement over the chance prediction for each group was as follows, SES 1: 27.7%, SES 2: 19.9%, SES 3: 17.8%, SES 4: 7.5%. In statistical terms, however, a difference of 7.5% when dealing with percentages around 90 as found in the high SES group is just as significant as a difference of 4.7% when dealing with percentages around 60 or 70 (as found in the lower SES groups).

Judging the results in terms of the "human errors" however, it is significant that proportionately more low-SES children are being identified incorrectly.

TABLE 22

SES AND PREDICTION SIGNIFICANCE

Prediction: Measures of Significance	SES 1	SES 2	SES 3	SES 4	All Students
Number of Students accurately predicted	80.7%	83.9%	86.8%	91.5%	86.3%
Accuracy expected by chance*	53 % (X^2=32)	64 % (X^2=32)	69 % (X^2=33)	84 % (X^2=27)	69 %
Accuracy expected if no identification	59 %	73 %	78 %	92 %	77 %
Identifying "at risk" children: efficiency**	86 %	79 %	76 %	50 %	74 %
Identifying "at risk" children: effectiveness**	63 %	55 %	57 %	63 %	58 %
Identifying "not at risk" children: efficiency	79 %	85 %	88 %	97 %	88 %
Identifying "not at risk" children: effectiveness	93 %	95 %	95 %	95 %	94 %

* all of the differences between the obtained accuracy rate of prediction and the accuracy expected by chance were statistically significant.

** Refer to page 37 for definition of "efficiency" and "effectiveness".

Table 23 gives the results for the effect of immigrant language background on prediction accuracy.

TABLE 23

THE EFFECT OF LANGUAGE BACKGROUND ON E.I.D.P. PREDICTION ACCURACY

Language Group	Number of Students	Percentage of Students Correctly Classified	E.I.D.P. Variables that Significantly Contributed to Prediction (in order)
1. English -- 1st Language	1,222	87	teacher ratings, D.A.P. I.Q., teacher-psychologist interview, copy forms
2. English not 1st Language -- born in Canada	296	86	teacher rating copy forms
3. English not 1st Language -- not born in Canada	478	87	teacher ratings, copy forms, teacher-psychologist interview
TOTAL	1,996	86.3	teacher ratings, copy forms, teacher-psychologist interview, D.A.P. I.Q.

(X^2 = 1.5, not sig.)

There was no significant difference in E.I.D.P. predictive validity among the 3 language groups when any of the prediction significant measures were examined. The efficiency and effectiveness of the E.I.D.P. in identifying both "at risk" and "not at risk" children was similar for all three language groups. Moreover, when the effect of both SES and language background was examined simultaneously no interaction was found, and all differences in accuracy could be attributed to the effect of a student's socio-economic background.

The effect of background on the predictive validity of the individual E.I.D.P. measures was examined and very consistent results were found. As socio-economic status increased, fewer errors were made in appropriately identi-

fying "at risk" and "not at risk" children. The language background of a student did not appear to effect the predictive validity of any E.I.D.P. instrument. Detailed results for each instrument are presented in Appendix B.

SUMMARY AND DISCUSSION

The Toronto Board of Education has accepted the early identification of learning problems as a major priority. Since 1968, children in Kindergarten and Grade One have been involved in different forms of early screening. During the early years of the program, large amounts of data were collected in order to determine the best procedure and best set of instruments to use in the identification process. The availability of the data for such a large sample of students provided an excellent opportunity to examine some of the questions relating to early identification of learning problems in a large urban multi-cultural school system. This study attempted to answer the following questions:

1) Are extensive screening devices combining groups tests with teacher-psychologist interviews and teacher ratings lists useful and accurate predictors of possible school learning problems?

2) Does a student's socio-economic status affect the validity of the screening techniques?

3) Does a student having a native language other than English affect the validity and accuracy of early screening?

4) How many and what kinds of students, in terms of background, are being missed by the screening or are being identified unnecessarily?

To answer these questions, three sets of data were collected: all results of the early identification process carried out in the 1969-70 school year for 5,000 Grade One students in 41 different public schools (This data included results on the Draw-A-Person test, Perceptual Forms test, Teacher-Psychologist Interview, and a Teacher's Rating Chart); the results of the 1970 Every Student Survey (This included information relating to a student's socio-economic status, language background, country of birth, and family situation); follow-up data on these students gathered four years after the E.I.D.P. process (This data included grade placement and results on the Wide Range Achievement Test).

About 2,000 students (45%) of the original sample were still in the Toronto system when the follow-up data were collected. The follow-up data for these students were examined in relation to the E.I.D.P. and background data.

The results revealed that in general, the E.I.D.P. assessment (Phase I only) combined with the teachers ratings were reasonably good predictors of both grade placement and achievement test results four years after the assessment. Specifically, in classifying students into 2 categories, "at risk" and "not at risk", the E.I.D.P. package (i.e., the best statistical combination of the instruments) classified 86% of the students correctly in terms of their grade placement four years later. Whether or not 86% is an adequate accuracy rate is a judgmental decision to be considered by everyone involved in the screening program. Statistically, however, one can be fairly confident in saying that the E.I.D.P. process along with the teacher ratings are good predictors of later achievement. In fact, without the E.I.D.P., if students were selected randomly as "at risk" or "not at risk", a 64% accuracy rate could be expected.

In examining the predictive validity of the screening process, it is also necessary to look at what types of errors in identification are made. Are children being missed who should be identified or are children being identified unnecessarily? As mentioned in the main text, the types of errors made are completely up to the program administrators, their priorities, and resources available. If few staff resources are available perhaps only the "worst" children should be identified because the staff could possibly not deal with a greater number of children. In this case, there would be more "missed" children, than children identified unnecessarily. As well, the philosophical issues around "labelling" and "classifying" children must be considered when implementing a large scale screening program.

The analysis of the types of errors made by the E.I.D.P. screening procedure revealed that, in general, in order to minimize the total number of identification mistakes, the 14% error rate was broken down into 9.5% "misses" and 4.5% "false alarms" (i.e., apparent unwarranted identifications). In predicting achievement test results as measured four years after the E.I.D.P. by the Wide Range Achievement Test, the E.I.D.P. package classified students into "at risk" and "not at risk" groups also with an 86% accuracy rate. However, other measures of prediction significance such as comparing the results to those expected by chance revealed that the E.I.D.P. was better in the prediction of grade placement than achievement test results.

Overall, the E.I.D.P. package appeared to be statistically significant in predicting potential learning problems in children, as suggested by grade placement and achievement tests in later grades. The analysis also revealed that certain instruments in the E.I.D.P. process were much more important to the prediction than others. The single most important part of the screening package was the Teacher's Ratings Chart. This instrument consisted of a teacher's ratings of a child's achievement in reading, mathematics, behaviour, and social skills. Taken alone, this instrument was almost as good as the total E.I.D.P. package in identifying "at risk" children. There are certain considerations however, that must be made before interpreting and generalizing this result. The most obvious concern is that the teachers' ratings were done at the end of Grade One, after almost a full school year's experience with the child, and after the rest of the E.I.D.P. process. Therefore, the teacher ratings may be seen in many cases as a culmination of the whole early identification process. A statistical analysis was performed to try and isolate the influence of the rest of the E.I.D.P. measures from the teacher ratings. The results revealed that half of the total "variance accounted for" in W.R.A.T.

scores by the total E.I.D.P. package was due to teacher ratings alone and half to the rest of the E.I.D.P. measures. Although this test is by no means a conclusive one, since the influence in the ratings of personal intervention by psycho-educational consultants cannot be measured, it does indicate that the teacher ratings contribute substantially to the prediction above and beyond the contribution of the information obtained from the rest of E.I.D.P. measures. Because the results of the teacher ratings were so significant to the prediction, differences between the other E.I.D.P. measures were difficult to detect. The question, "Were the teacher's ratings so good because of the E.I.D.P. process?" cannot conclusively be answered. However, there is no doubt that the classroom teachers provide very significant and valuable contributions to the early identification screening process.

The effect of a student's background on school achievement is a phenomenon well documented in educational research. Generally, the higher a student's socio-economic status, the better his/her achievement in school. All of the test results in this study supported this hypothesis. As socio-economic status increased, so did scores on the Draw-A-Person I.Q., Perceptual Forms test, Teacher ratings, and at follow-up, the Wide Range Achievement Test. In the teacher-psychologist interview, children of the lowest socio-economic group were almost twice as likely to be mentioned as having difficulty than were children of any other socio-economic group. Differences between boys and girls were also apparent in some of the scores. Girls tended to have better scores on the Draw-A-Person test, teacher ratings, teacher-psychologist interview, and W.R.A.T. spelling scores. It was interesting to find that the language background of the students had no significant effect on most of the test scores. Only in the teacher ratings and the W.R.A.T. reading and spelling scores did any differences among the language groups occur: Students not born in Canada but who spoke English as a first language

tended to score higher on those tests than any of the other immigrant/ language groups. Also, students from one or no-parent families tended to score slightly lower than children from 2-parent families in all of the tests. However, the differences there might be due to differences in SES between the groups.

When examining a student's grade placement four years after the Grade One screening some very significant differences were found among students of different background. Boys were more likely than girls to be in special education classes or behind one or two grades, as were students of single or no-parent families. The greatest differences however, were found between the socio-economic groups. Proportionately more low-SES students were found in special classes or behind a grade or two. In fact, almost half of the students in the special SES category (welfare, unemployed) were not up to the "expected" grade level.

Because a larger number of low-SES students are being identified as "at risk" one would expect, statistically, that more mistakes in identification would occur when identifying "at risk" and "not at risk" children of lower SES. This phenomenon was in fact, found to be true. The accuracy of the EIDP as a predictor of school achievement seemed to be significantly affected by the student's socio-economic group's liklihood of having problems in school. In other words, proportionately more mistakes in identification were made for the lower SES groups. For the four SES groups, the accuracy of the EIDP to predict future grade placement was as follows: SES-1 -- 81%, SES-2 -- 84%, SES-3 -- 87%, SES-4 -- 92%. When compared to the accuracy that would be expected by chance, the obtained accuracy for <u>each</u> SES group was a significant improvement. Although the rate of improvement over chance was about the same for each group, in terms of absolute differences, the improvement over chance was greater for the lower SES groups. However, it is

important to consider the prediction results in terms of human costs. The results tell us that, although the E.I.D.P. is a significantly better way to identify potential problems for all children than a chance prediction method, proportionately more incorrect identifications are being made with low-SES students. The effectiveness of the E.I.D.P. instruments to select the appropriate "at risk" children is also about the same for each SES group. But in the process of selection, because more low-SES children have problems in the school system, more errors in identifying these children were found.

Although significant differences in prediction accuracy were found among the SES groups, no differences at all were found among students of varying language and immigrant background.

Since the research phase of the E.I.D.P. began in 1967, changes in the philosophy and orientation of the program have taken place. Less emphasis is now being given to the identification of high risk children and more emphasis is being given to programming and curriculum intervention based on the results of the E.I.D.P. data. Unfortunately, it was not feasible in this study to examine the effect of any intervention that did result from the identification process. The lack of data on intervention that did occur resulted in a serious gap in the interpretation of the results. For example, it was impossible to tell whether students who were identified as "at risk" in Grade One who four years later appeared to be achieving at least at grade level, were identified unnecessarily, improved because of some intervention or were achieving in spite of any problem which might still exist. In other words, in the group of "false alarms" which are being called identification errors, there may be cases of program "success" (i.e., identification followed by successful intervention). Documenting the intervention data is crucial for any comprehensive examination of the long-term effect of the early identification process.

In spite of this gap in the data, some important conclusions can be drawn from the results that were obtained. The first result is that the early identification process used in 1969 (Phase I screening only) was a reasonably accurate method of identifying children with "potential" learning problems. The method was certainly more accurate than any chance method as well as being more accurate than not having an identification process at all. Although the instruments used in the E.I.D.P. since 1969 have changed and become more varied, the process of identification has stayed basically the same. The second result was the importance of the classroom teacher's contribution to the identification process. By itself, the teacher's contribution was more important than any other single test or instrument. The final results which related the background of the student to the accuracy of the early identification program revealed that although a student's language had no effect on identification accuracy, more identification errors were made with children of lower socio-economic status. This occurred largely because more low-SES children are identified as "at risk" and therefore the chance of error increases.

The implications of the results are compatible with the new prevention approach of the E.I.D.P. -- namely, the importance of the classroom teacher in both assessment and intervention, and the general ability of the process to accurately identify "at risk" children.

Given the new emphasis of the E.I.D.P. as a prevention model by the use of programming the curriculum intervention, any further research done on the effect of the E.I.D.P. demands comprehensive documentation and analysis of the relationship between identification, intervention, and follow-up.

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DENT DATA SHEET (MAY 1970)

APPENDIX A

NAME:_____ SCHOOL:_____

PLACE LABEL HERE ON COMPLETED FORMS

Check the boxes and fill in the blanks that apply to you.

Do not write in this space.

Were you born in Canada? YES ☐ what province?_____

NO ☐ what country?_____

6 7 8

If you answered "NO" how old were you when you came to Canada? _____ years old.

9 10

Was English the first language you learned to speak? YES ☐ NO ☐

11 12 13

If you answered "NO" what language did you learn to speak first?_____

Did you learn to speak English and another language at the same time?..... YES ☐ NO ☐

14 15 16

If you answered "YES," what was the other language?_____

How often do your parents speak English at home? (check one)

Never ☐

Sometimes ☐

Always ☐

17

Are both parents alive and living with you? (check one)

Both ☐

Only Mother ☐

Only Father ☐

Neither ☐

18

What is your father's job now?_____

What is your mother's job now?_____

19 20 21 22

If neither parent lives with you what is the job of the head of the household where you live?_____

23 24 25 26

E.I.D.P. LETTER TO PARENTS

Dear Parents:

For the past five years the Grade One children in many Toronto Schools have been assessed as part of a research-and-service project called the "Early Identification and Developmental Program". This screening program helps to identify at an early age the children who need special help, and is often useful for teachers in planning classroom activities.

This program has now become part of the regular school service at _____ School. All the Grade One children will be given group tests and possibly have brief individual contact with the psychoeducational consultant. If any further contact seems necessary to identify problems in learning we will, of course, be in touch with you.

_____

Principal.

Instructions for Administering

Perceptual Forms and Draw-A-Person

The Perceptual Forms and Draw-A-Person are drawn on two sheets of paper which have been stapled together. The papers should be prelabelled with each child's name and date of birth, as some children will be unable to print their names legibly, and birthdates are required for scoring. The teacher can help the children to get organized, and insure that everyone has a pencil. No crayons or erasers should be available.

The Perceptual Forms are displayed one at a time, either by holding up a large card or by projecting the designs on a screen. The children are asked to copy each one as well as they can. It is helpful to acknowledge that the last three cards (divided rectangle, and 2 diamonds) are difficult. For Kindergarten children the diamonds may be omitted. Also ask the children to write their name if they can.

The Draw-A-Person can be drawn on the back of the second sheet of paper, to save confusion with opening and folding the 2-page "booklet". When all are ready, the children are asked to "draw a person, a boy or girl, man or lady, draw the best person you can, do the whole person and only do one. Do it

as quietly as you can". Sometimes it is necessary to add a comment to discourage copying and to limit talking. Most of the children will complete their drawings very quickly. It is helpful to ask them to turn their papers over and put down their pencils after the drawing is finished, in order to prevent scribbling, etc. Stragglers can be encouraged by the suggestion that "when I count to 10 it will be time to stop".

As the Perceptual Forms can be controlled for time more easily than Draw-A-Person, it is usually preferable to administer Perceptual Forms first.

Additional informal group tests (such as number and letter printing, hand tracing, etc.), may be administered using the inside pages of the 2-page "booklet".

Scoring of Perceptual Forms

In general, it should be noted that:

- No penalty is given for size of drawings unless this becomes so extreme that it makes scoring difficult.

- Second or third attempts are accepted if done spontaneously but not if suggested by examiner.

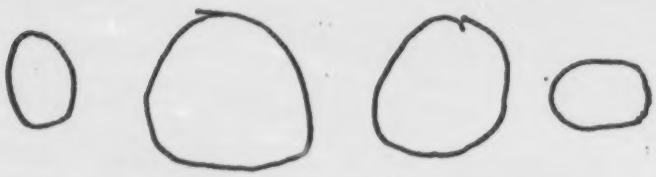
- On group tests rotation of the page cannot be penalized, but rotations of the figure are penalized.

- There is no reduction of score for poor arrangement or orientation on the page, or for overlap, but if the child uses the page edge or previously drawn line to form an integral part of a new figure he is penalized.

CIRCLE

Score 3 - Shape approximately round.
Fairly neat closure.

Score 2 - Somewhat flattened, otherwise satisfactory.
Some overlap or failure to join at point of closure, otherwise satisfactory.
Generally poor motor control, line somewhat wiggly but overall proportions of circle still fairly good.



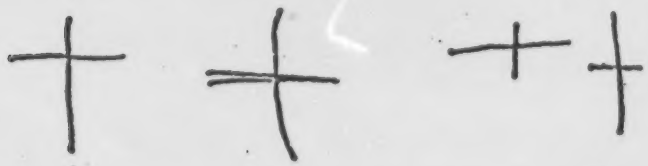
Score 1 - Circle flattened so one diameter is greater than 1½ x other diameter.
Shape of circle is largely though not entirely lost, e.g. through very distorted closure, the formation of an angle or one greatly flattened side.

Score 0 - Figure has become completely unrecognizable despite examiner's knowledge of which shape the subject has been given to draw.

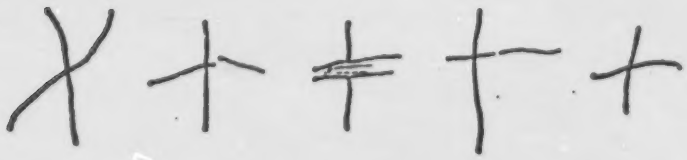
CROSS

Score 1 - Proportion and length of lines fairly accurate.
Lines approximately vertical and horizontal.
Figure drawn in two lines without a break at the centre.

Score 2 - Length of lines and/or proportion somewhat inaccurate, otherwise satisfactory.
One line poorly executed, tilted up to 15% and/or one line somewhat curved, crooked, or redone, otherwise satisfactory.



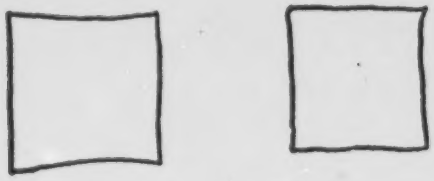
Score 1 - X rather than +. One line crossing other only near the end, or broken so as to suggest midline difficulties.
One or both lines very wavy.



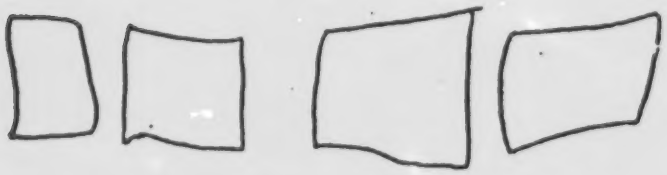
Score 0 - Figure completely unrecognizable. No figure Gestalt evident.

SQUARE

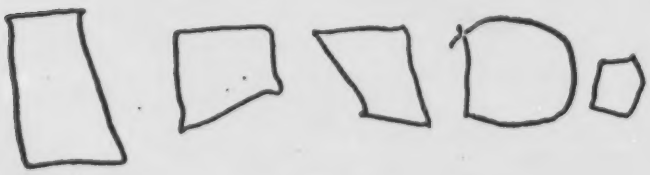
Score 3 - Four sides approximately equal in length.
Four corners fairly equal in size.



Score 2 - One or more sides curved, or poorly executed but angles still fairly adequate.
Angles somewhat unequal in size but square shape still apparent.
Length or width of one pair of sides not more than 1½ X that of the other pair, angles fairly accurate.



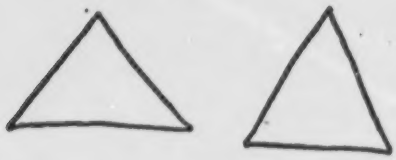
Score 1 - Length or width more than 1½ X that of the other sides.
One or more angles extremely distorted in size.
One side so waved that square almost unrecognizable, or one corner completely rounded.



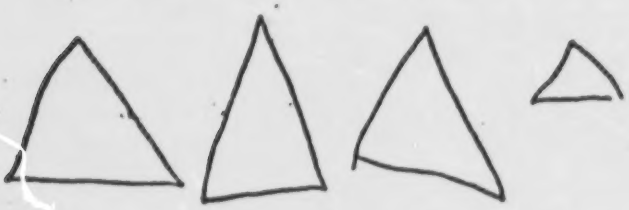
Score 0 - Figure completely unrecognizable.

TRIANGLE

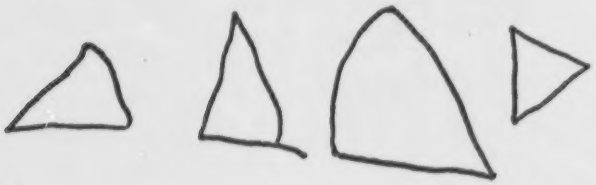
Score 3 - Two or three sides almost equal in length; base may be a little longer or shorter.
Angles approximately equal in size, lines straight, and vertex of triangle approximately centered over base line.



Score 2 - One or two sides somewhat wavy.
Base line up to 30° off horizontal.
Sides somewhat uneven in length.
Incomplete closure.
(Score can be given if 2 or 3 errors are present, as long as none is very severe.)



Score 1 - One or more sides extremely curved.
Base off horizontal more than 30°.
Angles very uneven or somewhat rounded.
One side considerably shorter than others.
(More than one of these errors can be present if the figure remains recognizable.)

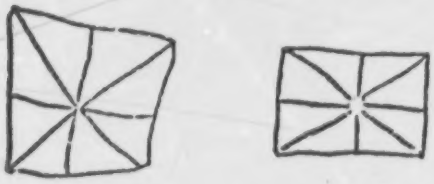


Score 0 - Figure unrecognizable.

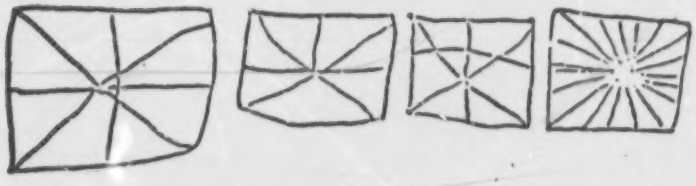
RECTANGLE

Score 3 - Proportions and angles approximately correct, lines fairly straight.
Lines cross at or near the centre of the figure.
Lines meet at or almost at a common point.
Lines are drawn continuously, not visibly stopping at the centre.

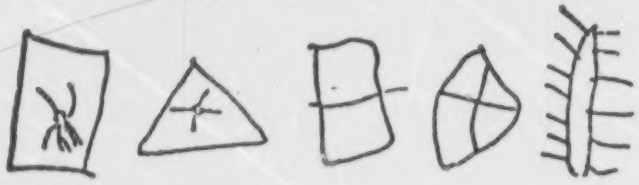
Score 2 - Sides somewhat unequal in length, sides or intersecting lines somewhat wavy.
Intersecting lines do not cross at or near a common central point, or lines are drawn to meet rather than cross in the centre. A heavily marked centre dot may be present.
Figure square rather than in proper proportions, and/or one or more angles quite poorly formed.



Score 1 - One angle missing, rounded, rectangular shape unclear.
Lines intersect extremely poorly failing to pass near a common point.
Extra lines or insufficient number of lines present, otherwise fairly satisfactory figure.
Lines fail to go to the correct general area on the circumference of the figure, e.g. don't go to the corners.

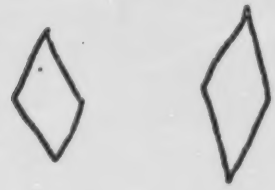


Score 0 - Figure unrecognizable or clearly poorer than those receiving a score of one.



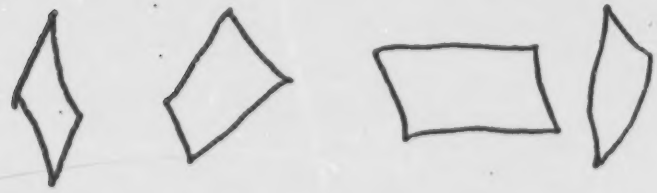
VERTICAL DIAMOND

Score 3 - Lines fairly straight, sides approximately equal in length.
Opposite angles approximately equal in size.
Height of figure noticeably greater than width.

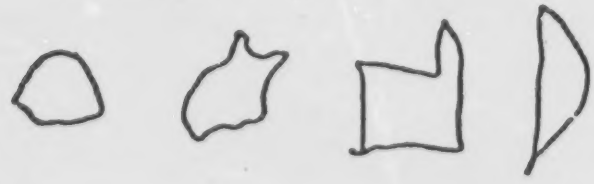


Score 2 - One or two lines somewhat curved or poorly controlled.
One or two sides noticeably longer or shorter than others, or angles unequal but general shape of figure is recognizable.
Figure generally good but height not apparently greater than length.

Score 1 - Figure tilted or angles distorted so that a rectangle rather than a diamond results.
One or two lines or one angle very curved, wavy or poorly executed.
Ears or other distortions present though shape still recognizable.
Figure rotated.
Width of diamond obviously greater than height.



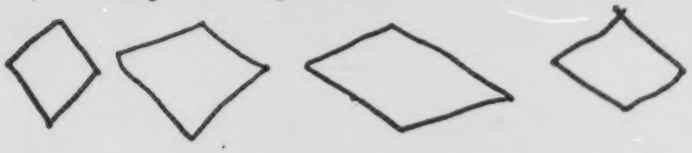
Score 0 - Shape completely unrecognizable.
Extra or fewer sides present.



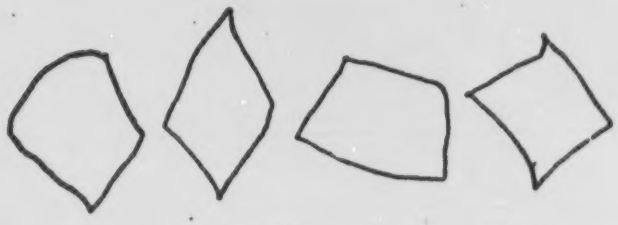
HORIZONTAL DIAMOND

Score 3 - Lines fairly straight, sides approximately equal in length.
Opposite angles approximately equal in size.
Width of figure noticeably greater than height.

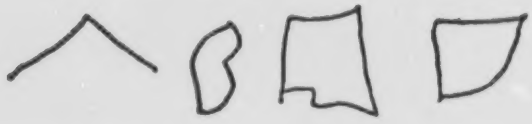
Score 2 - Figure generally good, but length not apparently greater than height.
One or two lines somewhat curved or poorly controlled.
One or two sides noticeably longer or shorter than others, or angles unequal but general shape of figure is recognizable.



Score 1 - Figure tilted or angles distorted so that a rectangle rather than a diamond results.
One or two lines or one angle very curved, wavy, or poorly executed.
Height of diamond obviously greater than width.
Ears or other distortions present though shape still recognizable.
Figure rotated.



Score 0 - Shape completely unrecognizable.
Extra or fewer sides present.



TORONTO EARLY IDENTIFICATION AND DEVELOPMENTAL PROGRAM

TEACHER-PSYCHOLOGIST INTERVIEW

Interview Date: _____

Pupil name _____ No. _____ School _____ Teacher _____ Psychologist _____ Birthdate: _____

01 Vision
-works unusually close to materials
-does not follow teacher's board examples
-eyes wander, turn in, squinting

02 Hearing
-does not respond when spoken to
-needs instructions repeated
-speaks too loudly

03 Gross Motor
-awkward, falls over own feet, bumps into things
-poor coordination in running, skipping, catching ball
-does not alternate feet on stairs

04 Fine motor and eye-hand coordination
-unable to manipulate small objects (scissors, pencils)
-avoids handwork
-pencil work is poorer than most of class; seems immature
-reversals in printing or reading
-shows left-right confusion (hand or progression)

05 Activity level
-restless, distractible, overactive
-lethargic, seems tired

06 Memory
-can't remember directions
-doesn't remember alphabet, words to songs, days of week, etc.
-forgets things from day to day

07 Concept formation
-has difficulty learning concepts such as same-different, large-small
-has difficulty doing puzzles or games
-doesn't understand sequence of time; before-after, early-late
-colour discrimination

08 Language
-foreign language
-enunciation
-impoverishment (vocabulary, sentence structure)
-cannot express his ideas

09 Attention span
-difficulty in concentrating on one task for longer than a few minutes. Easily distracted by environmental stimuli (visual or auditory).
-daydreaming excessively, blank periods

10 Behaviour Characteristics
-shy, withdrawn, rarely speaks spontaneously
-needs constant reassurance, perfectionistic
-excessively attention-seeking
-spoiled, pampered, manipulative
-doesn't respond to discipline
-aggressive, destructive, teasing, lack of self-control
-strange or inappropriate behaviour
-tense, fearful, cries, nervous mannerisms (nail-biting, tics, ...)

11 Group interaction
-dominates, follows
-disruptive
-isolate

12 Comments. Note any problems excluded above. Use back of sheet for additional notes.

Teacher's Rating Chart

Pupil .....Room No .....School.....

In each category, circle the number which best expresses your own opinion of this pupil.

1. Present level of instruction in Reading.

1. Readiness material
2. Chart Reading
3. Pre-primer
4. Primer
5. First Part of Book I
6. Second part of Book I
7. Book IIa (first half of Grade II)
8. Book IIb (last half of Gr. II)
9. Book IIIa (first half of Gr. III)
10. Book IIIb (last half of Gr. III)
11. Book IV (Gr. IV)
12. Beyond Book IV

2. Pupil's Reading performance.

1. Does not recognize words.
2. Reads with word recognition and comprehension at bottom level of class.
3. Reads with comprehension and fluency; conveys meaning at middle level of class.
4. Reads with word recognition and comprehension at top level of class.
5. Superior reader, able to comprehend most material encountered.

3. Pupil's ability to understand mathematical concepts and operations.

1. Very limited ability to understand mathematical concepts and operations.
2. Mathematical understanding and problem solving ability is at lower level of class.
3. Usually able to understand mathematical concepts and operations when presented by teacher.
4. Mathematical understanding and problem solving ability is at upper level of class.
5. Superior mathematical ability - quickly understands mathematical ideas presented by teacher.

4. Pupil's general performance level - the quality of his work.

1. Very low performance level. Quality poor.
2. Has considerable difficulty with work, below average performance.
3. Performance level is average.
4. Above average performance.
5. Work is far above average.
6. Performance is characterized by extreme variation. Work often ranges from poor to excellent.

5. Pupil's diligence in performing work.

1. Seems uninterested in improvement.
2. Makes an effort to concentrate.
3. Works at his ability level.
4. Diligent worker; somewhat above average.
5. Very diligent; far above average.
6. Diligence is characterized by variation between very little interest and extreme diligence.

Comments may be noted on back of page.

_____
Signature

The Effect of Background on Follow-Up Grade Placement

TABLE 24

GRADE PLACEMENT BY SEX

Sex	Number	Grade Placement		
		Special Education	Grade 3 or 4	Grade 5 or 6
Males	1,018	7.8%	22.1%	70.2%
Females	980	5.4%	13.4%	81.2%
TOTALS	1,998	6.6%	17.8%	75.6%

TABLE 25

GRADE PLACEMENT BY S.E.S.

S.E.S. *	Number	Grade Placement		
		Special Education	Grade 3 or 4	Grade 5 or 6
1 "special"	147	18.4%	24.5%	57.2%
2	921	7.3%	21.0%	71.8%
3	258	5.4%	21.7%	72.9%
4	179	5.0%	12.8%	82.1%
5	131	1.5%	7.6%	90.9%
6	312	.6%	8.3%	91.0%
TOTAL	1,948	6.6%	17.8%	75.6%

* Socio-economic status increases as code number increases

TABLE 26

GRADE PLACEMENT BY IMMIGRANT/LANGUAGE BACKGROUND

Language Background	Number	Grade Placement		
		Special Education	Grade 3 or 4	Grade 5 or 6
Canadian -- English 1st Lang.	1,150	7.6%	17.3%	75.2%
Canadian -- English not 1st Language	296	5.2%	17.6%	77.4%
Not Canadian -- English 1st Lang.	72	2.8%	19.4%	77.8%
Not Canadian -- English not 1st Language	478	5.0%	18.4%	76.6%
TOTAL	1,996	6.4%	17.7%	75.9%

TABLE 27

GRADE PLACEMENT BY FAMILY SITUATION

Family Situation	Number	Grade Placement		
		Special Education	Grade 3 or 4	Grade 5 or 6
Lives with both Parents	1,820	5.9%	17.5%	76.6%
Single or no Parent Family	181	11.6%	20.4%	68.0%
TOTAL	2,001	6.4%	17.7%	75.9%

The Effect of Background on W.R.A.T. Scores

TABLE 28

W.R.A.T. SCORES BY SEX

Sex	Mean Scores		
	Reading	Arithmetic	Spelling
Male	68.3	35.6	42.0
Female	70.0	35.8	44.0
Significance	(f = .79,n.s.)	(f = .5,n.s.)	(f = 17.4, p < .05)

TABLE 29

W.R.A.T. SCORES BY S.E.S.

S.E.S.	Mean Scores		
	Reading	Arithmetic	Spelling
1	61.2	32.9	39.1
2	66.5	34.8	42.0
3	67.1	35.0	42.3
4	70.6	36.1	43.8
5	73.3	37.6	45.8
6	78.3	39.6	47.9
Significance	(f = 47.1,p<.001)	(f = 50.9,p<.001)	(f = 36.4,p<.001)

TABLE 30

W.R.A.T. SCORES BY IMMIGRANT/LANGUAGE BACKGROUND

Language Background	Mean Scores		
	Reading	Arithmetic	Spelling
Canadian -- English 1st Language	68.7	35.6	42.6
Canadian -- English not 1st Language	68.3	35.	43.8
Not Canadian -- English 1st Language	71.2	36.4	44.5
Not Canadian -- English not 1st Lang.	68.6	35.8	43.4
Significance	(f = 2.7,p<.15)	(f = .9,n.s.)	(f = 2.96,p<.15)

TABLE 31

W.R.A.T. SCORES BY FAMILY SITUATION

Family Situation	Mean Scores		
	Reading	Arithmetic	Spelling
Both Parents present	69.0	35.9	43.3
One or no parents present	65.6	34.1	40.9
Significance	(f = 10.3,p<.05)	(f = 12.4,p<.05)	(f = 11.3, p<.05)

STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES 10/28/77

FILE EIDP (CREATION DATE = 12/09/76)

- D I S C R I M I N A N T A N A L Y S I S - - - - - -

SUMMARY TABLE for GRADE PLACEMENT

STEP NUMBER	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	NUMBER INCLUDED	WILKS' LAMBDA	SIG.	RAO'S V
1	TRCTOT		984.59309	1	0.63942	0.000	984.58301
2	TPITOT		81.87647	2	0.62096	0.000	1066.03369
3	COPYTOT		82.81522	3	0.60608	0.000	1135.11621
4	CAP.IQ		5.65555	4	0.60266	0.000	1151.36621

CLASSIFICATION FUNCTION COEFFICIENTS

	GROUP 1 SP.ED. OR BEHIND	GROUP 2 OK OR AHEAD
TPITOT	74.66555	73.75267
CAP.IQ	0.49081	0.50702
COPYTOT	0.92871	1.09149
TRCTOT	2.55676	3.41824
CONSTANT	-813.30566	-804.16282

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQ
1	0.65943	100.00	0.630	0	0.6026	843.

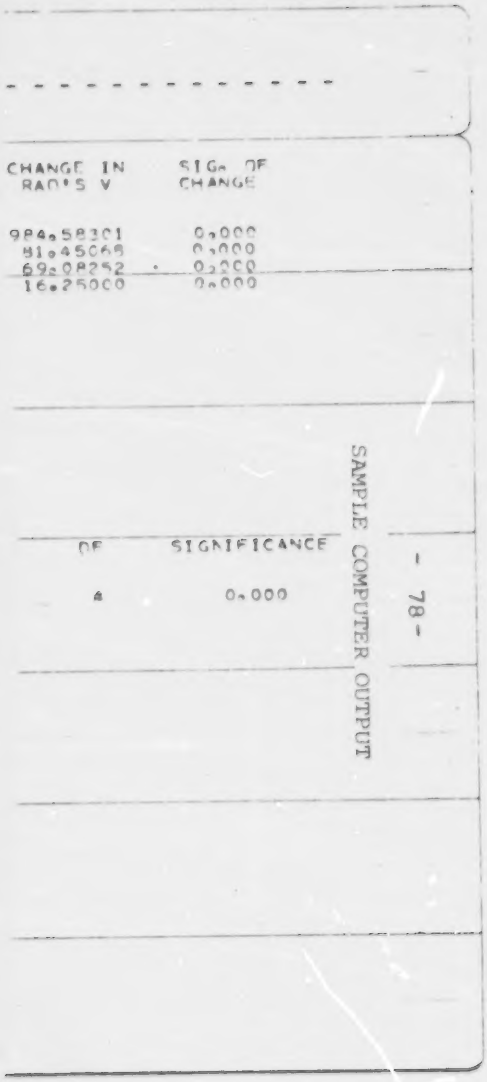
REMAINING COMPUTATIONS WILL BE BASED ON 1 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1
TPITOT	-0.21495
CAP.IQ	0.10034
COPYTOT	0.16960
TRCTOT	0.75649

CENTROIDS OF GROUPS IN REDUCED SPACE

	FUNC 1
GROUP 1 SP.ED. OR BEHIND	-1.16446
GROUP 2 OK OR AHEAD	0.34107



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CHANGE IN RADIUS V	SIG. OF CHANGE
984.58301	0.000
81.45069	0.000
69.08252	0.000
16.25000	0.000

DF	SIGNIFICANCE
4	0.000

SAMPLE COMPUTER OUTPUT

- 78 -

STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES 10/28/77

FILE EIDF (CREATION DATE = 12/09/76)

DISCRIMINANT ANALYSIS

SUMMARY TABLE for W.R.A.T. READING SUB-TEST.

STEP NUMBER	VARIABLE ENTERED	REMOVED	F TO ENTER OR REMOVE	NUMBER INCLUDED	WILKS' LAMBDA	SIG.	RAO'S V
1	TRCTOT		391.86792	1	0.81549	0.000	391.86182
2	DAP.IQ		21.62053	2	0.80543	0.000	418.23618
3	TRITOT		15.51529	3	0.79827	0.000	437.33423
4	COPYTOT		9.90947	4	0.79372	0.000	449.78149

CLASSIFICATION FUNCTION COEFFICIENTS

	GROUP 1	GROUP 2
TRITOT	74.41037	73.86674
DAP.IQ	0.50268	0.52181
COPYTOT	1.12282	1.21673
TRCTOT	3.33096	3.60418
CONSTANT	-813.07837	-808.85034

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQUARE
1	0.25971	100.00	0.454	0	0.7938	399.417

REMAINING COMPUTATIONS WILL BE BASED ON 1 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1
TRITOT	0.19282
DAP.IQ	-0.18056
COPYTOT	-0.16924
TRCTOT	-0.74325

CENTROIDS OF GROUPS IN REDUCED SPACE

		FUNC 1
GROUP	1	1.11901
GROUP	2	-0.18412

CHANGE IN RAO'S V	SIG. OF CHANGE
391.86162	0.000
26.47437	0.000
18.99805	0.000
12.44727	0.000

DF	SIGNIFICANCE
4	0.000

SAMPLE COMPUTER OUTPUT 79

Discriminant Analysis
3-Way Classification of W.R.A.T. Scores by E.I.D.P. Variables

TABLE 32

PREDICTION OF READING SCORES

E.I.D.P. Prediction	Actual Scores		
	Low	Average	High
"at risk"	5%	4%	0
"not at risk"	9%	63%	11%
"high scoring"	1%	2%	3%

71% accurate predictions

TABLE 33

PREDICTION OF ARITHMETIC SCORES

E.I.D.P. Prediction	Actual Scores		
	Low	Average	High
"at risk"	4.5%	4%	0
"not at risk"	9 %	67%	11%
"high scoring"	0	2%	2.5%

74% accurate predictions

TABLE 34

PREDICTION OF SPELLING SCORES

E.I.D.P. Prediction	Actual Scores		
	Low	Average	High
"at risk"	4.5%	3.5%	0
"not at risk"	8.5%	71 %	10%
"high scoring"	0	1 %	1.5%

77% accurate predictions

The Effect of Background on Prediction of Grade Placement

TABLE 35

S.E.S. AND PREDICTION

S.E.S.	Prediction	Actual Placement	
		Special Education or Grade 3 or 4	Grade 5 or 6
S.E.S. 1 (n = 147)	at risk	25%	4%
	not at risk	15%	55%
		(80% correctly classified)	
S.E.S. 2 (n =921)	at risk	15%	4%
	not at risk	12%	69%
		(84% correctly classified)	
S.E.S. 3 (n = 437)	at risk	13%	4%
	not at risk	10%	74%
		(87% correctly classified)	
S.E.S. 4 (n = 443)	at risk	5%	5%
	not at risk	3%	87%
		(92% correctly classified)	

TABLE 36

LANGUAGE BACKGROUND AND PREDICTION

Language Background	Prediction	Actual Placement	
		Special Education or Grade 3 or 4	Grade 5 or 6
English -- 1st Lang.	at risk	14%	4%
	not at risk	9%	73%
(n = 1,222)		(87% correctly classified)	
English not as 1st Lang. Born in Canada	at risk	15%	5%
	not at risk	9%	71%
(n = 296)		(86% correctly classified)	
English not 1st Lang. Not born in Canada	at risk	14%	4%
	not at risk	8%	74%
(n = 478)		(88% correctly classified)	

The Effect of Background on the Predictive Validity of Individual E.I.D.P. Measures

TABLE 37

SES AND PREDICTION OF GRADE PLACEMENT BY D.A.P. I.Q.

S.E.S.	Prediction *	Grade Placement	
		Special Education or Grade 3 or 4	Grade 5 or 6
S.E.S. 1 (n = 147)	at risk	12%	12%
	not at risk	31%	46%
		(58% correctly classified)	
S.E.S. 2 (n = 921)	at risk	8%	9%
	not at risk	20%	63%
		(71% correctly classified)	
S.E.S. 3 (n = 437)	at risk	6%	5%
	not at risk	16%	73%
		(79% correctly classified)	
S.E.S. 4 (n = 443)	at risk	1%	5%
	not at risk	7%	87%
		(88% correctly classified)	

* at risk -- D.A.P. I.Q.<84
not at risk -- D.A.P. I.Q.≥84

TABLE 38

SES AND PREDICTION OF GRADE PLACEMENT BY COPY FORMS

S.E.S.	Prediction *	Actual Placement	
		Special Education or Grade 3 or 4	Grade 5 or 6
S.E.S. 1 (n = 147)	at risk	12%	6%
	not at risk	30%	52%
		(64% correctly classified)	
S.E.S. 2 (n = 921)	at risk	9%	6%
	not at risk	19%	66%
		(75% correctly classified)	
S.E.S. 3 (n = 437)	at risk	6%	7%
	not at risk	15%	72%
		(78% correctly classified)	
S.E.S. 4 (n = 443)	at risk	2%	3%
	not at risk	6%	89%
		(91% correctly classified)	

* at risk -- Total score<8
not at risk -- Total score≥8

TABLE 39

SES AND PREDICTION OF GRADE PLACEMENT
BY TEACHER-PSYCHOLOGIST INTERVIEW

S.E.S.	Prediction	Actual Placement	
		Special Education or Grade 3 or 4	Grade 5 or 6
S.E.S. 1 (n = 147)	at risk	18%	8%
	not at risk	23%	51%
		(69% correctly classified)	
S.E.S. 2 (n = 921)	at risk	10%	6%
	not at risk	18%	66%
		(76% correctly classified)	
S.E.S. 3 (n = 437)	at risk	9%	6%
	not at risk	15%	70%
		(79% correctly classified)	
S.E.S. 4 (n = 443)	at risk	2%	8%
	not at risk	7%	83%
		(85% correctly classified)	

* at risk -- at least 1 difficulty discussed
not at risk -- no mentions at interviews

TABLE 40

SES AND PREDICTION OF GRADE PLACEMENT BY TEACHERS' RATINGS

S.E.S.	Prediction *	Actual Placement	
		Special Education or Grade 3 or 4	Grade 5 or 6
S.E.S. 1 (n = 147)	at risk	24%	8%
	not at risk	13%	55%
		(79% correctly classified)	
S.E.S. 2 (n = 921)	at risk	18%	7%
	not at risk	10%	65%
		(83% correctly classified)	
S.E.S. 3 (n = 437)	at risk	14%	4%
	not at risk	9%	73%
		(87% correctly classified)	
S.E.S. 4 (n = 443)	at risk	4%	2%
	not at risk	6%	88%
		(92% correctly classified)	

* at risk -- Total rating score<12
not at risk -- Total rating score≥12

TABLE 41

LANGUAGE BACKGROUND AND PREDICTION OF GRADE PLACEMENT BY D.A.P. I.Q.

Language Background	Prediction *	Actual Placement: Special Education or Grade 3 or 4	Actual Placement: Grade 5 or 6
English -- 1st Lang.	at risk	7%	6%
	not at risk	17%	70%
(n = 1,222)		(77% correctly classified)	
English not as 2nd Lang. Born in Canada	at risk	5%	7%
	not at risk	18%	69%
(n = 296)		(74% correctly classified)	
English not 1st Lang. Not born in Canada	at risk	6%	10%
	not at risk	17%	67%
(n = 478)		(73% correctly classified)	

* at risk -- D.A.P. I.Q.<84
not at risk -- D.A.P. I.Q.≥84

TABLE 42

LANGUAGE BACKGROUND AND PREDICTION OF GRADE PLACEMENT BY COPY FORMS

Language Background	Prediction *	Actual Placement	
		Special Education or Grade 3 or 4	Grade 5 or 6
English -- 1st Lang.	at risk	8%	6%
	not at risk	15%	71%
(n = 1,222)		(79% correctly classified)	
English not as 1st Lang. Born in Canada	at risk	6%	4%
	not at risk	17%	73%
(n = 296)		(79% correctly classified)	
English not 1st Lang. Not born in Canada	at risk	8%	6%
	not at risk	15%	71%
(n = 478)		(79% correctly classified)	

* at risk -- Total score<8
not at risk -- Total score≥8

TABLE 43

LANGUAGE BACKGROUND AND PREDICTION
OF GRADE PLACEMENT BY TEACHER-PSYCHOLOGIST INTERVIEW

Language Background	Prediction *	Actual Placement	
		Special Education or Grade 3 or 4	Grade 5 or 6
English -- 1st Lang.	at risk	10%	7%
	not at risk	15%	68%
(n = 1,222)		(78% correctly classified)	
English not as 1st Lang. Born in Canada	at risk	7%	7%
	not at risk	15%	71%
(n = 296)		(78% correctly classified)	
English not 1st Lang. Not born in Canada	at risk	8%	6%
	not at risk	15%	71%
(n = 478)		(79% correctly classified)	

* at risk -- at least 1 difficulty discussed
not at risk -- no mentions at interview

TABLE 44

LANGUAGE BACKGROUND AND PREDICTION OF GRADE PLACEMENT BY TEACHERS' RATINGS

Language Background	Prediction *	Actual Placement: Special Education or Grade 3 or 4	Actual Placement: Grade 5 or 6
English -- 1st Lang.	at risk	15%	4%
	not at risk	9%	72%
(n = 1,222)		(87% correctly classified)	
English not at 1st Lang. Born in Canada	at risk	16%	5%
	not at risk	7%	72%
(n = 296)		(88% correctly classified)	
English not 1st Lang. Not born in Canada	at risk	14%	8%
	not at risk	9%	69%
(n = 478)		(83% correctly classified)	

* at risk -- Total rating score<12
not at risk -- Total rating score≥12

END